

State of Arizona

Aquatic Invasive Species

Management Plan

September 2011

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Executive Summary:

Background and Plan Information

Aquatic invasive species (AIS) in Arizona are an issue of great concern. Steps must be taken to avert the extensive costs and damages which aquatic invasive species might afflict on Arizona's ecosystems, industry and economy; this is one of the many functions served by an Arizona Aquatic Invasive Species Management Plan (AzAIS). Once established, many invasive species prove exceptionally difficult to manage or eradicate. Main pathways for introduction of AIS into Arizona include waterways and river systems which connect to neighboring states, along with interstate boating traffic and other human introductory means. Section 1204 of the Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990 (NANPCA, as amended by the National Invasive Species Act (NISA) of 1996) requires that this management plan "identifies those areas or activities within the state, other than those related to public facilities, for which technical and financial assistance is needed to eliminate or reduce the environmental, public health and safety risks associated with aquatic nuisance species." This plan focuses on the identification of feasible, cost-effective management practices and measures to be taken on by state and local programs to prevent and control AIS infestations in a manner that is environmentally sound. The three main goals identified in the plan are structured to be achieved through the implementation of strategic actions and tasks designed to solve specific problems. The plan identifies a number of priority AIS that are considered to be highly detrimental, worthy of immediate or continued management action. The management actions outlined in this plan concentrate on these priority species. The plan will be periodically revised and adjusted based upon the practical experience gained from implementation, scientific research, and new tools, as they become available. The implementation table summarizes the plan's funding from all sources. Implementing the programs outlined in this plan will require a coordinated tribal, Federal, State and private effort, and the continued dedication of funding.

Concerns, Challenges, and Overall Goal

The goal of this plan is as follows:

To fully implement a coordinated strategy designed to prevent new unintended introductions of AIS into the Colorado River and state waters, to limit the spread of established populations of AIS into un-infested waters of the state, and to abate harmful ecological, economic, social and public health impacts resulting from infestation of AIS.

Although many challenges exist in the identification and management of invasive species, this comprehensive management plan has been composed to address all foreseeable issues in the most effective way possible. Due to the intricacies and unique complications presented by aquatic ecosystems in Arizona and their respective invasive species issues, this plan was developed to compliment and support the broad-based Arizona Invasive Species Management Plan, published in 2008. Species of particular concern are listed via a prioritization

scheme; careful consideration has been placed on order by which threats should be addressed. This plan seeks to minimize negative consequences associated with AIS, and to preserve the state of Arizona's natural resources.

Plan

Plan recommendations are organized in six categories as presented in Section (Objectives, Strategies and Actions, see page) and Section (Implementation Table, see page). Each of these recommendations has a plan for implementation and funding for a four-year period, as delineated by the implementation table. An overview of the six recommendation objectives is provided below:

1. Coordinate and Implement a Comprehensive AIS Management Plan
 - a. Coordinate all AIS management programs and activities within Arizona
 - b. Participate in and support regional, federal, and international efforts to control AIS.
 - c. Increase existing funding and resources for AIS management and establish new funding and resources.
 - d. Review and evaluate State efforts addressing AIS.
2. Prevent the Introduction of AIS into Arizona
 - a. Research and address potential AIS and their pathways of introduction.
 - b. Increase enforcement and awareness of existing laws controlling the transport, propagation, sale, collection, possession, importation, purchase, cultivation, distribution, and introduction of AIS.
 - c. Promote legislation and regulations that establish or increase the state's authority to control the introduction of new species.
3. Detect, Monitor, and Eradicate Pioneering AIS
 - a. Implement a surveillance and early detection program.
 - b. Develop an early response mechanism to deal with detected and potential AIS.
 - c. Eradicate pioneering populations of AIS.
4. Where Feasible, Control or Eradicate Established AIS that Have Significant Impacts
 - a. Limit the dispersal of established AIS into new waters or into new areas of a water body or drainage.
 - b. Control known nuisance populations where economically and technically feasible.
5. Increase and Disseminate Knowledge of AIS in Arizona through Data Compilation and Research
 - a. Facilitate the collection and dispersal of information, research, and data on AIS in Arizona.
 - b. Research AIS for their impact on native biota utilizing regional efforts & literature searches.
 - c. Research alternative management techniques for their effect on AIS and native species.

6. Inform the Public, Policy Makers, Natural Resource Workers, Private Industry, and User Groups about the Risks and Impacts of AIS
 - a. Inform the public about AIS, and how their actions can help prevent the spread and reduce the impacts of AIS.
 - b. Train natural resources personnel in AIS identification.
 - c. Inform private industry on AIS identification, their effects, and the laws regulating them.

Conclusions

Aquatic invasive species are a current and looming threat. The capacity for damages incurred by AIS is only rising, and a plan addressing ways to combat these threats is necessary. Overall, this invasive species management plan provides a robust but flexible means by which to prepare for and manage all aquatic invasive species issues in the state of Arizona. Further details are included in each section regarding history of invasions, concerns, groups involved, goals, objectives, actions, and implementation steps. All sections were constructed to maximize the strength and capabilities of this plan, as well as to inform readers on an in-depth level about the challenges at hand, and the nature of AIS issues and control.

Introduction:

The introduction of non-indigenous aquatic invasive species (AIS) into the lower Colorado River and the inland waters of Arizona threatens the ecological integrity of the state's water resources, as well as economic, public health and social conditions within our state. Because they have few natural controls in their new habitat, AIS spread rapidly and often become the predominant effectors of once natively driven environments. Consequences of AIS presence in Arizona include the destruction of native plant and animal habitat, damaged recreational sites and opportunities, lowered property values, clogged waterways, negative impacts on irrigation and power generation, and decreased overall biodiversity.

The coordinated efforts contained within this plan are designed to protect the citizens of Arizona from the multitude of losses associated with AIS animals and plants. This plan focuses on eliminating the threat of accidental AIS introductions. The plan also seeks to reduce and ultimately eliminate costs and damages incurred as a result of aquatic invasive species. Management actions are to be further described and delineated through the course of this document, with a main emphasis placed on detection, treatment, and removal of AIS in Arizona. The intentional introduction of non-indigenous species for aquaculture, commercial, or recreational purposes is addressed to insure that these beneficial introductions do not result in accidental AIS introductions, and to improve information sharing among those agencies responsible for regulating intentional introductions.

Geographic Scope of Plan:

Arizona's aquatic systems play a major role in maintaining biodiversity and state resources. The variety of aquatic environments present in Arizona spans a wide breadth of conditions; these vary from high altitude mountain lakes to warm water streams and tributaries. The Colorado River flows west through the Grand Canyon and then south to form the state's western boundary. The Gila, Salt, and Verde rivers drain the north-central portion of the state and carry water to reservoirs that support cities and agriculture in central and southern Arizona. Many smaller creeks and tributaries have perennial or intermittent flows, and along with springs, ciénegas (marshes), and stock tanks supply valuable aquatic habitat. The Central Arizona Project (CAP) and Salt River Project (SRP) canals extend throughout numerous portions of the state. Such variety greatly increases the probability that any given AIS might find some location within Arizona to reside and flourish. Due to the wide dispersal and varied conditions of bodies of water across Arizona and the potential for species transferences over long distances via canal and irrigation systems, Arizona's aquatic invasive species management plan must cover the entire state.

Arizona is a state with many diverse watersheds; each presents unique challenges and qualities with respect to climate, ecology, and options for effective management. Two maps are included in the appendices (Appendix C), with additional in-detail information on particular

watersheds available at (<http://ag.arizona.edu/azaqua/watershed/water.html>). Additionally, a database known as iMapInvasives has been established to track AIS distributions across Arizona.

Arizona has established the iMapInvasives project as the state's main database for AIS distribution information. iMapInvasives is an online, interactive, GIS based map and database where any agency or organization can contribute and obtain AIS locality information. The goal of this project is to include all invasive species organizations of Arizona as users of this website in order to institute a standardized and cooperative outlet to share data. This database can provide essential information to monitor the extent of AIS in Arizona such as distribution or point specifics on AIS occurrences, treatments, surveys or projects. iMapInvasives will act as an important and useful tool in AIS data sharing and management analysis by its many functions and advanced technological capabilities. The map itself allows users to view distribution and point-specific information for any AIS and also allows a user to customize the type of map and geographical details in view. The GIS technology provides the option to apply various layers in order to obtain relevant information for any monitoring or management purpose. The map view can be adjusted to Google Streets, Aerials, Terrain, Hybrid, or USGS Topographic Quads layers and also provides functional layers such as Arizona Watersheds, major rivers and streams, Wildlife Manager Districts, etc.

In addition to the visual map portion of the website, iMapInvasives is a tool for generating customized and specific reports about an AIS. It offers the option to query data provided by a certain person or agency, occurrence dates, survey area, treatments, or geographical elements. Arizona's involvement in the iMapInvasives project will assist agencies in cooperative efforts to share and use data that otherwise would be inaccessible. The iMapInvasives project has the capability of pulling in existing data from various sources such as The Nature Conservancy's Weed Information Management System (WIMS) and the Southwest Exotic Mapping Program (SWEMP). It will allow integration of various datasets, while still allowing personal ownership and management of existing data set, or if one chooses, to fully integrate datasets into iMapInvasives for future management.

Many aquatic invasive species have entered Arizona's waters in the past 100 years, but often they were poorly documented, or not documented at all. Most successful invasives such as salt cedar, bullfrogs, and crayfish have become so widespread that it is nearly if not impossible to find out where they first became established. Even more recent invasions such as quagga mussels (*Dreissena bugensis*), the New Zealand mudsnail, and others have poorly known ranges and distributions within the state, often only known on an agency-by-agency basis. This all depends on the current importance or effect of an invasive to a respective agency, such as water delivery or changing trophic status. The AzAIS plan seeks to increase coordination and overall data sharing among agencies, to most effectively approach management options and strategies.

In 2005, Arizona Governor Napolitano established the Arizona Invasive Species Advisory Council (AISAC) by Executive Order 2005-09 and charged it with developing a

coordinated, multi-stakeholder approach to dealing with invasive species issues and drafting recommendations for invasive species management. By January 2007 the AISAC was established as a permanent body under the joint leadership of the Arizona Game and Fish Department and the Arizona Department of Agriculture. The Order directed the AISAC to develop an invasive species management plan by June 30, 2008, based on the framework recommended in the initial AISAC report and centered on five focal strategic concepts:

- Leadership and Coordination
- Research and Information
- Management
- Anticipation and Outreach
- Control and Management

The state of Arizona concurrently began work on an invasive species plan to deal strictly with aquatic invasive species. Many people contributed toward the invasive species plan focused directly on the challenges and management strategies associated with aquatic organisms, which includes goals and contents outlined by the federal ANS task force as well as state agencies. Advice and recommendations were also taken from the Western Regional Panel on Aquatic Nuisance Species Quagga-Zebra Mussel Action Plan, and the Lower Colorado River Giant Salvinia Task Force Action Plan.

Proper management of shared waters and ample interstate cooperation will be key to the success of containing AIS in the western region. California published their first AIS plan draft in 2004; New Mexico and Utah did so in 2008. Colorado has a plan currently under development; Nevada took part in the Lake Tahoe Interstate Management plan but at present is without a state plan. Because of the waterway connectivity Arizona shares with these states by means of various rivers and tributaries (Virgin River with Utah, Gila River with New Mexico, Colorado River through Utah, Nevada, Colorado, California, etc.), the establishment of interstate communication and planning in the future will be of great importance. Future revisions and expansions of the AzAIS into multi state policy and protocols will be pursued as neighboring states establish management plans. Ideally, the AzAIS will establish inter-state and inter-agency cooperative agreements and collaborative efforts, both to efficiently manage shared waters and also to share research data and findings. Combined environmental risk assessment efforts for shared waters would be cost effective for both states involved, and should be pursued.

Scientific review has been incorporated into plan development by the inclusion of faculty from the University of Arizona in AIS working groups and meetings, along with review of the document on several occasions. Drafts and notices on the progress and goals of the AIS management plan have received overwhelming support and encouragement by forms of correspondence including emails, letters, phone calls and various forms of public comment. Upon finalization of the plan, additional comments may be received and subsequently addressed.

Arizona's AIS Management Plan will be reviewed and revised periodically as a portion of the larger Arizona Invasive Species Management Plan. The specific tasks employed to accomplish our goals and objectives must remain flexible to assure efficiency and effectiveness. This version of the Arizona AIS Plan is a good step towards identifying and integrating existing AIS programs, and implementing new programs, but future editions will be necessary to fully accomplish our goals.

Problem Definition and Ranking

A growing number of invasive aquatic plant and animal species have adversely impacted the productivity and biodiversity of Arizona's native species and altered a variety of aquatic ecosystems. Most introductions are the result of human activities, such as recreational watercraft transport, municipal and industrial water use, and alterations to the waterways. Tourism at the Grand Canyon brings visitors from across the country, as well as many international visitors. Lake Havasu, Mojave, and Powell are all some of the most highly trafficked lakes in the country, with Havasu alone logging over a million boat hours in a single year (2009 Arizona watercraft survey). Alterations such as damming and water diversion may also favor AIS over native species. Utilization of the iMapInvasives program will help agencies in the state of Arizona in work done to quantify the number of AIS present in the state, and where highest likelihood of transports may be occurring.

There are many ways organisms can be transported by human activities. Major pathways through which nonnative species are introduced into inland and state border waterways include aquaculture, aquarium trade, biological control, transport via recreational boating and fishing, research activities, and movement of nonnative species through channels and canals. Some introduction pathways, such as the aquaculture industry, are currently regulated to minimize the risk of new AIS introductions, while others have developed few or no precautions.

The introduction of non-indigenous species is not a new phenomenon in Arizona. Numerous species are causing or threaten to cause numerous serious problems throughout the state, from the Colorado River on the north and west to the San Francisco Drainage on the east, and in many of the reservoirs created in between. With its many reservoirs and warm weather, Arizona is a popular vacationing spot for boaters. This opens an easy method of cross country transfer, especially for species such as the quagga mussel (*Dreissena bugensis*), which has now become established in the state, by attachment to boats and trailers. Quagga mussels were first documented in Arizona in Lake Mead in 2007, and have since become an invasive threat across several state waters. Zebra mussels (*Dreissena polymorpha*) alone were estimated to have had an impact on industries, businesses and communities from 1993-99 at over \$5 billion around the Great Lakes area (statistic from AGFD quagga mussel risk analysis). The environmental and socioeconomic costs resulting from AIS infestation will only continue to rise with further successful AIS introductions. This comprehensive state management plan for AIS provides

guidance on management actions to prevent, control and limit the impacts of AIS that have invaded or may invade Arizona's waters.

The following sections will cover the history of non-native introductions to the state, and will delineate the most current and primary threats by a prioritization scheme.

Sport fishing has brought numerous non-indigenous fish species into the state, from the eastern states and abroad. Sport fish stocking for recreational fishing is managed appropriately, but means of introduction of other exotic species have created new AIS threats. Non-native bait species often effect native species populations inadvertently. While restrictions now prohibit intentional introductions of many species, unintentional and illegal introductions remain a concern. The growing aquaculture industry in the state as well as aquarium trade and backyard water gardening has brought many tropical aquatic species from around the world which easily become established in the warm climate that Arizona has yearlong. The alteration of Arizona watersheds with the building of reservoirs has altered the riparian habitat in many areas of the state, often in ways that favor AIS over those native and often endemic to the state. Tamarisk has become established and overtaken native cottonwood and willow vegetation in riparian zones with altered flow regimes.

The aquatic plant purple loosestrife was introduced in the 1980s, and quickly became an invasive threat across the US. Arizona eradicated purple loosestrife within the state via numerous management actions, and is the only state in the continental US without an established population.

Giant salvinia is one of the world's most noxious aquatic weeds and is notorious for dominating slow moving or quiet fresh waters (Mitchell et. al., 1980). Its rapid growth, vegetative reproduction, and tolerance to wide-ranging environmental stress make it an aggressive, competitive species known to impact aquatic environments, water use and local economies. Giant salvinia is commonly sold for use in aquaria and ponds. It is passively dispersed by wind and or currents in aquatic systems, and often unintentionally spread by clinging to fishing gear and boating equipment. Giant salvinia was first observed in Arizona in 1999, in the Imperial National Wildlife Refuge on the Colorado River. Giant salvinia has since invaded portions of the lower Colorado River, and has been observed floating through Cibola National Wildlife Refuge, Pretty Water, and Three Fingers Lake. One source of infestation was identified at the Palo Verde Irrigation District, management and treatment actions have ensued in this area. Actions have included construction of barriers, clearing of impacted drains, and intensive herbicide applications. Attempts at control of Giant salvinia have contributed to reduction of the AIS, though eradication has yet been reached. In 2003, the salvinia weevil (*Cyrtobagous salviniae*) was introduced as a biological control agent, which has assisted in the control, but not eradication of Giant salvinia.

The presence of invasive New Zealand mudsnail (NZMS) was first confirmed in 2002 at Lee's Ferry and Lake Mead. Since then, populations have been identified in the Colorado River below Glen Canyon Dam, through the Lee's Ferry reach and Grand Canyon, and into Lake Mead. The mudsnail may occur in other waters, but confirmed occurrence exists within the aforementioned distribution. Mudsnails will passively move into connected reservoirs, waterways, and ponds (USGS 2002). They present an extra management challenge, as they also are capable of surviving on damp media for extended amounts of time. NZMS have been reported to survive out of water for several hours (Gangloff 1998). The survival of NZMS increases if kept in damp media, such as the felt soles of a wading boot; Winterbourn (1970) reported 50% survival after 25 days in damp media. It is likely that their spread within California and from Idaho to Montana and Wyoming were the result of unintentionally being transported on damp media such as wading gear (Hosea and Finlayson 2005). This is the likely pathway for the NZMS to be introduced into other waterways within Arizona.

Quagga mussels have become established in various state waters and are of high risk for additional introduction to water bodies in Arizona. Quagga mussels are native to the Dnieper River drainage in Eastern Europe. They arrived in the United States by ballast water discharged into the Great Lakes in 1989. They were first discovered in Arizona in Lake Mead on January 6, 2007. How they entered Lake Mead is unknown, but most likely they were transported on the hull of a recreational boat. Quagga are currently found in Lake Mead, Lake Mohave, Lake Havasu, the Colorado River below Lake Havasu, the Central Arizona Project canal (CAP) and Lake Pleasant. The hydrologic connections with these infected waters will allow the quagga to expand its range into the lower Colorado River and Mexico. The CAP initially takes water from Lake Havasu and then delivers it to Lake Pleasant where it is stored and released on a seasonal basis. CAP water released from Lake Pleasant is delivered to Salt River Project (SRP) canals on an intermittent basis; this water is then delivered for municipal, agricultural and industrial use in central Arizona, with CAP canals delivering water to Tucson at its terminus. The main sources of water for SRP canals are the reservoirs on the Salt and Verde River systems and wells in the Phoenix metropolitan area. The primary method of quagga mussel overland dispersal is through human-related activities. Adult quagga have the ability to attach to hard surfaces and survive out of water, which allows them to infest new waters by hitching rides on watercraft and other water-based equipment. The microscopic larvae can be transported to new waters in bilges, live wells, bait buckets, or any other equipment that holds water. The transport of recreational boats with attached mussel larvae between bodies of water is the primary means of dispersal within Arizona. It is extremely difficult to stop the downstream spread of quagga from infected waters but quagga may be contained through cooperative partnerships between recreational water users, commercial ventures, water and land management entities, and government agencies and organizations. Organizational coordination and planning are crucial in developing statewide and watershed level strategies to address the quagga mussel issue in Arizona. The participating organizations that are currently working on these strategies are the Arizona Game and Fish Department, Maricopa County Parks and Recreation, U.S. Forest Service, Central Arizona

Project, Bureau of Reclamation, Bureau of Land Management, Salt River Project, U.S. Fish and Wildlife Service, 100th Meridian Initiative, the Western Regional Panel of the Aquatic Nuisance Species Task Force and others. Their work is critical in providing effective direction and resources to encourage voluntary public assistance in restricting the spread of quagga mussels. Educational outreach, enforcement, and monitoring are key components to successful quagga management in Arizona.

All AIS have costly environmental, ecological, agricultural and industrial impacts. As increasing numbers of AIS become fully established in the reservoirs that feed the extensive canal system in Arizona, the impact on water users and utilities across the state will be widespread. These canals provide a rapid means of transport of AIS to waters across the state. The cost to address complications caused by AIS in these systems such as clogged water intakes and pumping stations has the potential to be immense to the public.

Arizona is in a unique position to focus efforts on prevention and control of several species that have caused millions of dollars of damages in other states. Increased preparedness and coordination with multiple states and agencies resulting from Arizona's AIS plan has the potential to minimize AIS impacts, both economic and ecological. The plan also outlines methods and management objectives for detection and subsequent control of AIS within the state.

THREATENED IMPACT OF AQUATIC INVASIVE SPECIES IN ARIZONA

Potential threats from AIS may be evident depending upon the degree of negative impact these species have upon the environment, industry, and the economy. AIS are associated with the following:

- losses of native biodiversity;
- threats to ESA listed species;
- increased alteration to ecosystem function and structure;
- reduced aquatic habitat for native biota and recreational fishing;
- increased costs of canal maintenance and fouled water intakes;
- hampered power generation capabilities;
- increased interference of water transfer and efficiency of water delivery systems;
- impacts to human health;
- inferior water quality;

- decreased recreational opportunities;
- increased safety concerns for swimmers;
- decreased property values;
- threatened aquaculture production.

The following sections on freshwater animals and plants provide information on non-indigenous species and discuss invasive species of concern. These draft lists are intended to provide a basis for discussion and further work identifying the presence, distribution, status, and threat of AIS. These will be updated, maintained, categorized and standardized as new information is received, assessed, and assimilated. Some high priority species are listed and discussed below:

Freshwater Animals

A list of restricted freshwater non-indigenous animals in Arizona is included in Appendix A. The list will be updated frequently as the introductions of non-indigenous animals are continuous and the impacts of each may not be fully understood.

The quagga mussel (*Dreissena bugensis*) has been found in Arizona waters and is considered to be a high priority AIS due to the severe impact in the Colorado River Basin. Quagga (and zebra) mussels are both listed as Arizona aquatic invasive species and present similar challenges; the mention of quagga or zebra mussels in terms of this plan means to imply both. The quagga mussel is a very successful and disruptive AIS. It can survive and reproduce in a wide range of habitats and environmental conditions, producing 40,000 eggs per breeding cycle with multiple cycles every year. It has microscopic veligers (larvae) that can pass through filters and strainers and remain suspended in the water column for up to four weeks. It has a tendency to aggregate and form massive colonies, attaching to both hard and soft substrates. It filters large amounts of water (up to one liter/individual/day). A quagga invasion alters the aquatic environment in ways that have direct impacts on wildlife and water uses. By consuming significant amounts of phytoplankton they can disrupt the ecological balance of entire bodies of water and eventually impact and alter both our native and sport fisheries. Invasive mussels attach themselves to hard surfaces with byssal threads, creating an environment that accelerates pitting and corrosion. As a result, lake and river structures such as bridges, docks and navigational equipment require more frequent cleaning, maintenance, and replacement due to the corrosion and the increased weight of the mussel aggregation. Water intake structures that supply water for municipal and agricultural uses are at risk from increased hydraulic roughness and clogging. Not only can quagga directly affect intake structures plugging them, quagga can also restrict cooling water for pumps, engines and power plants. These reductions in flow can cause many problems of their own.

There are no species of crayfish indigenous to Arizona. Currently, Arizona has two non-native crayfish species (*Orconectus rusticus* and *Cherax quadricarinatus*) that were originally introduced as a means of aquatic vegetation control, fishing bait, and aquaculture. Crayfish have had an immense adverse impact on the ecosystems they were introduced into decreasing overall biodiversity of fish, amphibians, and macroinvertebrates. Crayfish have spread rapidly through the state and the introduction of additional crayfish species is of great concern. Both the rusty (*Orconectus rusticus*) and red claw (*Cherax quadricarinatus*) crayfish are listed through AGFD AIS Directors Order 1 as aquatic invasive species. Crayfish provide a distinct challenge in identification, as differences among species are often subtle and difficult to notice. Thus, some uncertainty is present and may be unavoidable in accounting for the effects of any given species of crayfish, though many are thought to be present and have deleterious effects on Arizona's waterways and native aquatic biota.

The American bullfrog (*Lithobates catesbeianus*) was initially introduced as a food source for humans in Arizona. Bullfrogs compete with and often times prey upon many aquatic species and have detrimental effects on native fish and amphibian populations. Bullfrogs often have detrimental effects on protected native species, such as the Chiricahua leopard frog and Mexican garter snake, and has been proposed for listing as an Arizona aquatic invasive species.

Impacts of the New Zealand mudsnail (*Potamopyrgus antipodarum*) can fall into three categories: competition with and competitive exclusion of aquatic grazers (primary consumers); biomass/nutrient sequestration; and reduction in growth of higher level consumers (predators - fishes) in aquatic systems. Evidence suggests that New Zealand mudsnails, due to their potentially high population numbers and virtual invulnerability to natural controls, will; out compete native gastropods (Richards 2003), spatially exclude other grazing aquatic organisms by their high density (Cada 2003), and compete with other macro-invertebrates for periphyton (Gangloff 1998, Cada 2004). It is also possible that very dense snail populations may have a significant adverse impact on available nutrients in streams. These dense populations can consume significant nutrients (food) in an aquatic ecosystem and, because the snails are relatively immune to predation, sequester those nutrients making them unavailable to other species in the food chain. New Zealand mudsnails are capable of passing through the digestive canal of many fishes, alive and intact (Bondesen and Kaiser 1949; Haynes et al. 1985). New Zealand mudsnails even when consumed, become a "trophic dead end" with fish receiving little, if any nutrition from feeding on them (Vinson 2004; Ryan 1982). This will ultimately have a significant adverse impact on the fish populations through reductions in nutritious benthic invertebrate fauna to the benefit of low-nutritional value mudsnails (Hosea and Finlayson 2005). New Zealand mudsnail has been listed through AGFD AIS Director's Order as an aquatic invasive species.

Other species of concern and their respective status, permit requirements and restrictions may be found in the appendices. See also Article 4, Live Wildlife, R12-4-406.

Freshwater Plants

Some invasive, non-indigenous freshwater weeds pose a serious threat to Arizona state waters while the impacts of others are still undetermined. A current freshwater non-indigenous plant species list can be found in Appendix B. Some pressing species are listed and discussed below:

Hydrilla (*Hydrilla verticillata*) spreads through vegetative fragments. Transportation on boating equipment plays the largest role in introducing hydrilla fragments to new bodies of water. Hydrilla has been found in isolated locations in Arizona. Hydrilla seriously effects water use and flow. Hydrilla will block sunlight penetration, which ultimately impacts boating, fishing and swimming. Water quality becomes degraded due to oxygen depletion.

Brazilian elodea (*Egeria densa*), and parrotfeather (*Myriophyllum aquaticum*) are other freshwater submersed species of concern in Arizona.

Purple loosestrife (*Lythrum salicaria*) is a priority emergent species that has spread throughout the continental US, and was established in Arizona for a time. It was eradicated, and has not become established again in Arizona. Through education of the public we have the opportunity to exclude this ecosystem-altering AIS from our state. The possibility of invasion is still, and always will be, a threat.

Giant salvinia (*Salvinia molesta*) is a priority floating plant currently found in the lower Colorado River and is currently listed through AGFD AIS Directors Order 1 as an aquatic invasive species. This aquatic fern has had major impacts to slow moving waters in the southeast U.S. and around the world. Giant salvinia has the potential to alter aquatic ecosystems in several ways. Rapidly expanding populations can overgrow and replace native plants with resulting dense surface cover preventing light and atmospheric oxygen from entering the water. Decomposing material drops to the bottom, greatly consuming dissolved oxygen needed by fish and other aquatic life (Thomas and Room 1986).

Algae

Although algae are taxonomically different from submersed and emergent aquatic vegetation, ecologically they are similar enough to include in a section on non-indigenous plants. As a group, algae are cosmopolitan and sometimes noxious, and potentially toxic. Blooms of cyanobacteria (more closely related to true bacteria than algae but included in this section) can occur in almost any water body given proper conditions for this to happen (usually associated with eutrophication). Large blooms of algae can and have caused numerous fish kills due to dissolved oxygen depletion and resulting anoxia and hypoxia.

It is beyond the scope of this plan to address problems concerning eutrophication and toxicity of most species. In some cases, eutrophication is a natural condition of the water body in question while in some cases it is caused by human activity. Cultural eutrophication, and its

effects, is currently handled by agencies such as the Arizona Department of Environmental Quality who will assign limits on algae growth and water quality either on a regional or case-by-case basis. Since algae identification is not easily done in the field and since few in the state have the capability to accurately identify species, limited data exists on the spread or current distribution of noxious or potentially toxic species.

One algal species appears to be a relatively recent introduction and has caused numerous and large fish kills: the golden alga (*Prymnesium parvum*). This species produces a potent ichthyotoxin (prymnesin) and was first observed in Apache Lake in the spring of 2004 following a fish kill. It then appeared to spread to downstream reservoirs causing fish kills of increasing magnitude. Since this time, numerous fish kills have been reported in urban lakes in the Phoenix Metropolitan area both connected and unconnected to the Salt River watershed. The exact environmental requirements for *P. parvum* growth and toxicity are not completely understood. Current research is attempting to make these determinations. Due to its devastating effects on gilled aquatic organisms, both native and introduced, we include *P. parvum* in the priority species list.

The invasive benthic diatom, didymo (*Didymosphenia geminata*), is now listed in AGFD AIS Directors Order 1 as an aquatic invasive species. Didymo blooms affect benthic macroinvertebrate communities through habitat alterations and food web interactions and also make recreational activities visually unpleasant. Extensive algal mats may cause a modification on river hydraulics and biofouling of municipal, industrial, and agricultural water intakes. In 2009, a suspected bloom of Didymo occurred downstream of Davis Dam on Lake Havasu. Although further examinations by the AGFD and the Arizona Department of Environmental Quality did not detect any Didymo cells present, diatomaceous stalks were discovered in the benthos.

AIS PRIORITIZATION

Prioritization of which AIS pose the greatest threat to waters of the state is difficult and somewhat subjective. Obviously an AIS that threatens sportfishing will be most important to those who enjoy sportfishing; an AIS that threatens to decrease flow in a canal will be most important to those agencies involved with water conveyance; and an AIS that threatens to alter structure and function of natural waters of the state will be most important to those agencies charged with maintenance or preservation of these areas. The only commonality all AIS share is that they are all presently, or have the potential to, impair a waterway of the state for either anthropocentric use or intrinsic value; most have the capability for both.

We currently do not have enough knowledge about any particular AIS to predict with any great degree of accuracy the exact environmental conditions needed for their spread or proliferation. Obviously, humans often play a major role in the spread of AIS; some introductions are intentional and some are not. In addition to human-caused spread of AIS, an additional reason for AIS invasion is a change in environmental conditions that now allows them to competitively exclude or somehow displace native aquatic organisms. The introduction of AIS

is not a new phenomenon and “natural” introductions of these organisms have occurred over millennia. However, the vast majority of introductions are not, and have not been, successful due to competition for resources by established native populations. For the most part, we have no records of introductions that have been unsuccessful or have come and gone un-noticed; humans only notice the successful introductions. It is imperative that Arizona coordinate with neighboring states to keep watch over cryptogenic species and their potential pathways between states, or into Arizona. The number of interstate waterways and shared waters create numerous opportunities for species not yet identified as AIS to enter the state of Arizona; without an established plan to detect and monitor organisms in these waterways, invasions may not be caught until after they are underway (i.e. quagga mussels). AZGFD has published a number of ecological risk assessments regarding known AIS; information from these are distributed within this plan, and provide guidance and insight as to the potential cost various species might inflict to the citizens of Arizona. AZGFD continues to provide risk assessments as more AIS are identified and researched. The eventual publication of ecological risk assessments for each known AIS will be a critical tool for the continued management of these species in Arizona. Cost estimates are based off previous management efforts and experience, and reflect the best estimate regarding equipment, manpower, and cost to implement these strategies.

Aquatic ecosystems change over time. Some changes are natural while others are either directly or indirectly human-caused. Natural temporal variability, coupled with human-caused changes to native aquatic ecosystems, complicates predicting which AIS species is going to pose the greatest risk in any given region in the near or short term. Therefore, the prioritization list that follows should be frequently re-evaluated and this AIS plan should be considered an active document subject to change in the future.

Although difficult, prioritization is essential in determining where efforts should be focused to manage AIS. We have established three prioritization categories with a rationale for each given below. It is important to mention that any listing of AIS, or their prioritization, is non-exhaustive and needs to be frequently updated as conditions warrant.

Potential Impacts and Threat Score

Efforts will be taken to prioritize AIS after consideration of several impact and threat factors. Anthropocentric and environmental factors will both be considered.

- Human health
- Human infrastructure
- Commerce
- Recreation
- Ecological impact to native or economically valuable species
- Environmental health
- Intrinsic value of native wildlife

The relative abundance of AIS under investigation is also to be considered, with priority given to species that are the most abundant and negatively impacting Arizona. Those species with distributions having little impact versus wide distributions posing extra management challenges will weigh on prioritization as well. If the AIS in question has not yet been officially documented in Arizona, the above factors are still to be considered as a “priority of threat analysis”, to be used in directing focus of early detection and rapid responses for emerging AIS populations in the state.

Actions to be considered:

- Prevention (outreach, education, enforcement)
- Early detection, rapid response (EDRR)
- Containment/control
- Eradication – localized
- Management (no eradication possible)
 - Prevention of spread
 - Minimization of impacts

Priority 1: AIS whose introduction and spread has already caused, or has the potential for, significant impairment of a water body (or water bodies) within the state for either anthropocentric use or intrinsic value. Efforts at containment through prevention of introduction of species are likely to have the greatest environmental and/or economic impact. Control and management of these species is deemed the most necessary.

- Giant salvinia (*Salvinia molesta*)
- Golden algae (*Prymnesium parvum*)
- Hydrilla (*Hydrilla verticillata*)
- New Zealand mud snail (*Potamopyrgus antipodarum*)
- Quagga mussel (*Dreissena rostriformis bugensis*)
- Silver carp (*Hypophthalmichthys molitrix*)
- Whirling disease (*Myxobolus cerebralis*)
- Zebra mussel (*Dreissena polymorpha*)

Priority 2: AIS whose introduction and spread may have, or has the potential to impair a water body or bodies within the state, detracting from either anthropocentric use or intrinsic value. These AIS do not currently have as great a potential for wide-spread harm to aquatic systems as Priority 1 AND/OR their presence in the state has only been anecdotal. They are highly localized so that spread appears relatively minimal AND/OR the introduction and potential spread of these AIS, and subsequent impairment, appears to be imminent or great. Priority 2 consists of populations which might be controlled locally. Management mode and/or control, prevention, and/or eradication are to be considered.

- Bighead carp (*Hypophthalmichthys nobilis*)
- Chytrid fungus (*Batrachochytrium dendrobatidis*)
- Didymo a.k.a. “rock snot” (*Didymosphenia geminata*)
- Eurasian watermilfoil (*Myriophyllum spicatum*)
- Northern snakehead (*Channa argus*)
- Purple loosestrife (*Lythrum salicaria*)
- Redclaw crayfish (*Cherax quadricarinatus*)
- Rusty crayfish (*Orconectes rusticus*)

Priority 3: AIS whose introduction and spread within the state seems minimal compared to Priority 1 or Priority 2 AIS, however, the potential for introduction and spread exists AND/OR these AIS have already caused large-scale impairment to aquatic systems in Arizona but have become so firmly entrenched or wide-spread throughout the state that currently the management, remediation, and control of these AIS seems infeasible or is otherwise logistically difficult or impossible. Specifically, we recommend the following prioritization:

- Asiatic clams (*Corbicula* spp.)
- Bullfrog (*Rana catesbeiana*)
- Giant reed (*Arundo donax*)
- Golden apple snail (*Pomacea canaliculata*)
- Nutria (*Myocastor coypus*)
- Northern crayfish (*Orconectes virilis*)
- Round goby (*Neogobius melanostomus*)
- Viral hemorrhagic septicemia (order *Mononegavirales*, family *Rhabdoviridae*, genus *Novirhabdovirus*)

GOALS

The goals of the Arizona AIS management plan are to eliminate or minimize the harmful ecological, economic, and social impacts of AIS through preventing new introductions, reducing further spread of existing populations, and managing/controlling population growth of AIS in Arizona. Arizona’s AIS plan also seeks to facilitate both state and federal agencies in accomplishing their long-term conservation and management goals.

These goals will be achieved through implementation of a plan that;

- initiates and emphasizes prevention strategies;
- requires risk assessment and review for all aquatic non-indigenous species prior to their importation, transport, or use in Arizona;
- promotes early detection;
- includes development of contingency plans;
- permits appropriate and timely response to new and existing populations;

- aims to establish control and containment of AIS in Arizona
- protects and restores native plant and animal communities;
- provides access to current and accurate distribution and management information;
- incorporates outreach, education, and research elements;
- recommends funding levels adequate for effective implementation;
- encourages interagency collaboration;
- facilitates inter-jurisdictional coordination with state, federal and tribal agencies; and
- seeks cooperative solutions with the private sector and user groups.

It is not possible to address all potential AIS, their impacts, and the constraints and contingencies that may develop. Consequently, this plan is intended to be adaptable to changing circumstances. As a result, continual review of the plan is imperative to use the latest information and procedures to limit the spread of AIS both into and within Arizona.

EXISTING AUTHORITIES AND PROGRAMS

This section provides a brief discussion of nonnative species authorities and programs in Arizona, as well as regional activities, federal law, and international agreements. The policies regarding nonnative species are controlled and enforced by a network of regulatory agencies and organizations. Primary coordinating agencies are noted below.

FEDERAL

No single federal agency has clear authority over all aspects of AIS management, but many agencies have programs and responsibilities that address aspects of the problem, such as importation, interstate transport, exclusion, control, and eradication. Federal activities on AIS management are coordinated through the Aquatic Nuisance Species Task Force (ANSTF). In February 1999, President Clinton signed Executive Order (EO) 13112, which requires all federal agencies to collaborate in developing a national invasive species management plan that will include terrestrial and aquatic species. A brief description of the President's Executive Order, the Nonindigenous Aquatic Nuisance Prevention and Control Act (NANPCA), and the National Invasive Species Act (NISA) is provided below.

Executive Order 13112 on Invasive Species

President Clinton signed EO 13112 on Invasive Species (64 Fed. Reg. 6183, Feb. 8, 1999), on February 3, 1999. The EO seeks to prevent the introduction of invasive species, provide for their control, and minimize their impacts through better coordination of federal agency efforts under a National Invasive Species Management Plan to be developed by an

interagency Invasive Species Council. The Order directs all federal agencies to address invasive species concerns, as well as refrain from actions likely to increase invasive species problems. The National Invasive Species Management Plan was finalized on January 18, 2001. It can be found on the Council website at www.invasivespecies.gov.

Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (NANPCA; Title I of P. No.101-646, 16 U.S.C. 4701 et seq.)

This Act established a federal program to prevent the introduction of, and to control the spread of, introduced ANS and the brown tree snake. The U.S. Fish and Wildlife Service (USFWS), the U.S. Coast Guard (USCG), the Environmental Protection Agency (EPA), the Army Corps of Engineers (CoE), and the National Oceanic and Atmospheric Administration (NOAA) share responsibilities for implementing this effort. They act cooperatively as members of the national Aquatic Nuisance Species Task Force (ANSTF). The purposes of NANPCA are:

- to prevent unintentional introduction and dispersal of non-indigenous species into waters of the United States through ballast water management and other requirements;
- to coordinate federally conducted, funded or authorized research, prevention control, information dissemination and other activities regarding the zebra mussel and other ANS;
- to develop and carry out environmentally sound control methods to prevent, monitor and control unintentional introductions of non-indigenous species from pathways other than ballast water exchange;
- to understand and minimize economic and ecological impacts of non-indigenous ANS that become established, including zebra/quagga mussels; and
- to establish a program of research and technology development and assistance to States in the management and removal of zebra/quagga mussels.

Under NANPCA, state governors are authorized to submit comprehensive management plans to the Task Force for approval that identify areas or activities for which technical and financial assistance is needed. Grants are authorized to states for implementing approved management plans, with a maximum federal share of 75% of the cost of each comprehensive management plan. The state (or private) contribution is 25% of total program costs.

National Invasive Species Act (NISA; P. L. No.104-332)

In 1996, Congress reauthorized and amended NANPCA, creating NISA. The amended act addressed the need to expand efforts beyond ballast water and zebra mussels, and to address additional avenues of introduction and the variety of nonnative species associated with those pathways. NISA also established provisions to create additional regional panels around the

country to interact with the ANS Task Force and provide regional and local recommendations, planning, and an infrastructure for action.

The Sikes Act (16 USC 670a-670o, 74 Stat. 1052), as amended, Public Law 86-797, approved September 15, 1960

The Sikes Act provides for cooperation by the Departments of the Interior and Defense with State agencies in planning, development and maintenance of fish and wildlife resources on military installations throughout the United States. Military installations with significant natural resources are required to prepare in cooperation with the Department of the Interior and State agencies integrated natural resources management plans (INRMPs) [including invasive species management]. The Sikes Act also requires that the Secretary of the Interior, in consultation with state fish and wildlife agencies, to submit a report annually to respective Congressional committees with oversight responsibilities on the amounts expended by Interior and state fish and wildlife agencies on activities conducted [including invasive species management] pursuant to INRMP's. In 2009 the Sikes Act was amended to clarify the authority of the Department of Defense to enter into interagency agreements with other federal agencies to implement natural resource programs [including invasive species management] on military installations. In 2010 the Sikes Act was amended again to include state-owned lands supporting National Guard facilities to the requirements of the Sikes Act.

U.S. Fish and Wildlife Service programs (Primary Coordinating Agency)

The U.S. Fish and Wildlife Service's Aquatic Invasive Species Program is housed within the Fisheries and Habitat Conservation Program's Division of Fisheries and Aquatic Resource Conservation. The Branch of Aquatic Invasive Species essentially houses three functions:

- **The FWS Aquatic Invasive Species Program** – The AIS Program seeks to prevent the introduction and spread of AIS, rapidly respond to new invasions, monitor the distribution of and control established invaders, and foster responsible conservation behaviors through its national public awareness campaigns (Stop Aquatic Hitchhikers and Habitattitude).
- **Administration of Aquatic Nuisance Species Task Force** – The Branch of AIS builds capacity, coordinates, and implements AIS prevention and control activities authorized under the Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990 (NANPCA, as amended by the National Invasive Species Act (NISA) of 1996), including: co-chairing and administering the ANSTF, supporting Regional Panels, providing grants for State/Interstate ANS Management Plans, and implementing a National AIS program.
- **Injurious Wildlife Evaluations and Listings** – The AIS Program supports the Injurious Wildlife Provisions of the Lacey Act through an ongoing process of evaluating species and possibly listing them as injurious through the rulemaking process.

The AIS Program has worked to prevent populations of invasive species like Asian carp and zebra/quagga mussels from entering or spreading into the United States. Priority containment (boat inspection and decontamination), early detection and rapid response (snakehead eradication and Chicago Sanitary Shipping Canal), interjurisdictional coordination and planning (Quagga/Zebra Mussel Action Plan and 100th Meridian), and regulatory (injurious wildlife listing of black and silver Asian carp) and non-regulatory actions (Stop Aquatic Hitchhikers!) have occurred across many jurisdictions. Through the actions of the AIS program, a national AIS network has been built – including 39 states, 6 Regional panels, over 1,000 participants in two national public awareness campaigns and many other partners – that has planned, directed and accomplished significant regional and landscape level invasive species prevention and management resource outcomes. The AIS Program serves as the nation’s front line for prevention of new aquatic invasive species by regulating imports of injurious wildlife, facilitating behavioral change and managing pathways to limit the introduction and spread of invasives (awareness campaigns and ballast water), and developing monitoring programs for invasion hotspots to facilitate early detection and rapid response.

U.S. Forest Service (USFS)

The U.S. Forest Service uses multiple authorities to manage aquatic and terrestrial invasive species (including vertebrates, invertebrates, plants, and pathogens), derived from laws enacted by Congress that authorize the Secretary of Agriculture to administer the agency (particularly the 193 million-acre National Forest System) and other resources and to issue necessary regulations. Many of these authorities have subsequently been delegated from the Secretary to the Chief of the U.S. Forest Service. Forest Service invasive species activities are guided by the agency’s National Strategy and Implementation Plan for Invasive Species Management (2004) and other associated policies and program plans. The U.S. Forest Service uses its authorities and broad base of expertise to conduct activities to prevent, detect, control, mitigate, and research aquatic and terrestrial invasive species across a wide variety of landscapes and agency programs, including Forest Service Research and Development, State and Private Forestry, International Programs, and the National Forest System. The U.S. Forest Service emphasizes an integrated pest management approach against aquatic and terrestrial invasive species, utilizing a science-based structured decision-making process to prioritize activities across landscapes, and incorporates invasive species management considerations into Forest Land and Resource Management Planning efforts (Forest Plans) nationwide. The U.S. Forest Service provides technical and financial support to States and local organizations to address complex invasive species problems and establishment of cooperative partnerships against aquatic and terrestrial invasive species. The U.S. Forest Service participates on local, regional, and national invasive species coalitions and committees; including the Aquatic Nuisance Species Task Force and various ANS Regional Panels.

U.S. Geological Survey (USGS)

USGS plays an important role in Federal efforts to combat invasive species in natural and semi-natural areas through early detection and assessment of newly established invaders, monitoring of invading populations; improving understanding of the ecology of invaders and factors in the resistance of habitats to invasion; and development and testing of prevention, management, and control methods. USGS invasive species research encompasses all significant groups of invasive organisms in terrestrial and aquatic ecosystems in all regions of the United States.

U.S. National Park Service (NPS)

The National Park Service manages two National Recreation Areas (NRAs) in Arizona: Lake Mead NRA and Glen Canyon NRA. These contain large reservoirs; Lake Mead NRA has an established population of quagga mussels. These two Recreation Areas implement quagga and zebra mussel prevention and containment programs with combined annual budgets of over \$2 million dollars. The NPS also manages Grand Canyon National Park and 19 smaller units within the state of Arizona, several with aquatic resources that are vulnerable to AIS.

U.S. Department of Agriculture Animal and Plant Health Inspection Service (APHIS)

The Animal and Plant Health Inspection Service, U.S. Department of Agriculture, has broad mandates related to the importation and interstate movement of exotic species, under the Federal Plant Pest Act, the Plant Quarantine Act, and several related statutes. The primary concern is species that pose a risk to agriculture. APHIS restricts the movements of agricultural pests and pathogens into the country by inspecting, prohibiting, or requiring permits for the entry of agricultural products, seeds, and live plants and animals. APHIS also partners with the U.S. Department of Homeland Security (DHS) to prevent the introduction of agricultural pests and diseases at U.S. ports of entry. Restriction of interstate movements of agricultural plant pests and pathogens occurs by imposing domestic quarantines and regulations. APHIS' Plant Protection and Quarantine (PPQ) program is a key part of this effort. The PPQ program develops quarantine policies and regulatory requirements for agricultural commodities and plant resources; Establishes requirements for and facilitates the safe import and export of agricultural products; Monitors and surveys throughout the country for pests and diseases; Prevents, detects, manages, and if possible, eradicates foreign pests and diseases in the United States; Develops scientifically advanced, environmentally sound methods to respond to plant health threats; and collects and analyzes pest data, both in the United States and overseas, to identify and evaluate pathways for the introduction and movement of invasive plant pests and weeds. APHIS also restricts interstate transport of noxious weeds under the Federal Noxious Weed Act.

Department of Defense (DOD)

The Department of Defense has diverse activities related to non-indigenous species. These relate to its movements of personnel and cargo and management of land holdings. Armed forces shipments are not subject to APHIS inspections. Instead, the DOD uses military customs inspectors trained by APHIS and the Public Health Service.

Bureau of Reclamation (BOR)

The Bureau of Reclamation's Environmental Applications and Research Group, along with its cooperators, is developing Integrated Pest Management (IPM) techniques for Reclamation facilities. Some of the topics currently being developed by the Aquatic Site Pest Management Team include biological control agents, improved pesticides and application techniques, studies on pest physiology, mollusk research, mapping, and re-vegetation studies.

Bureau of Land Management (BLM)

The BLM implements multiple strategies in combating invasive species. These include BLM's Partners Against Weeds (PAW) Plan, the Department of the Interior's Invasive Plant Management Plan, and the National Invasive Species Management Plan. Also, as part of its implementation of the National Fire Plan, the BLM acts to reduce invasive weeds that function as fire fuels and works with partners to enhance native plant restoration. In treating infestations, the BLM uses an integrated management approach that employs the method or combination of methods that will have the greatest positive effect with the minimum negative environmental impact. The BLM uses biological, mechanical and chemical control methods. It is BLM policy to use chemical pesticides only after considering alternative methods. Volunteers and partners play a significant role in helping land managers remove invasive species from public lands. Management of animal species, including invasive animals, on BLM lands is completed in cooperation with partnering state and federal agencies. The BLM is actively involved in Quagga mussel research and management at Lake Havasu.

REGIONAL

Western Regional Panel (WRP) (Primary Coordinating Agency)

The WRP on ANS was formed under a provision in NISA. The initial, organizational meeting of the WRP was held in 1997. The WRP was formed to help limit the introduction, spread, and impacts of ANS into western North America. This panel includes representatives from federal, state and local agencies, including private, environmental, and commercial interests. The purposes of the WRP, as described in NISA, are to:

- Identify Western Region priorities for responding to ANS;
- Make recommendations to the federal ANS Task Force regarding an education, monitoring (including inspection), prevention, and control program to prevent the spread of the zebra/quagga mussels west of the 100th Meridian;

- Coordinate, where possible, other ANS program activities in the West not conducted pursuant to NISA;
- Develop an emergency response strategy for federal, state, and local entities for stemming new invasions of ANS in the region;
- Provide advice to public and private individuals and entities concerning methods of preventing and controlling ANS infestations; and
- Submit an annual report to the federal ANS Task Force describing activities within the western region related to ANS prevention, research and control.

Western Governors Association (WGA)

The WGA was established in 1984 to address key policy and governance issues common to the 18 Western states, two territories and one commonwealth. In June of 1998, the association passed Resolution 98-018, Undesirable Aquatic and Terrestrial Species, for the purpose of developing and coordinating strategies and management actions to control and prevent the spread and introduction of undesirable species; to support the use of Integrated Pest Management concepts; to encourage broad-based partnerships; and to urge adequate support for the U.S. Department of Agriculture - Animal and Plant Health Inspection Service (APHIS). Resolution 98-018 was followed by Resolution 02-21, Undesirable Aquatic, Riparian, and Invasive Species, and most recently by Resolution 04-12, Undesirable Aquatic, Riparian, and Invasive Species. The WGA has formed a working group of state and federal agencies, industry, non-governmental organizations and academia to develop Western strategies to limit the spread of these species. The entire Resolution 04-12 is in Appendix E.

U.S. Army Corps of Engineers, Los Angeles Division, Arizona-Nevada Field Office (CoE)

The CoE is currently involved in more than 36 projects throughout the state. In other states, the CoE coordinates activities between federal, state, and local agencies and organizations working on AIS related projects.

TRIBAL

There are 19 federally recognized Tribes in Arizona that comprise 28% of the land in Arizona, with 6.6% of the state's population being Native American. Tribal lands with reservoirs, lakes, rivers and streams represent watersheds that commonly cross state and tribal boundaries. A coherent strategy for AIS depends on addressing all waters of the region. However, federal reserved lands are subject to federal, not state law. Tribes are also empowered to develop Tribal laws under the Clean Water Act and other authorities. With the myriad of authorities and regulations that apply to waters of this region, it is of critical importance that there exists a well-coordinated strategy for AIS problems that commonly transcend jurisdictional boundaries.

STATE

In Arizona, state and local agencies can play a major role controlling the spread of nonnative species. States have authority to decide which species can be imported and/or released. However, the U.S. Constitution vests the power to regulate international and interstate commerce to Congress. Federal law may preempt state law, but states retain almost unlimited power to define which species are imported and/or released. Although many state agencies have some authority to regulate AIS, no centralized authority or management structure exists to coordinate AIS activities in Arizona. This section describes the existing laws, regulations, and policies related to AIS that various state agencies have for managing AIS (also see Appendix F).

Arizona Invasive Species Advisory Council (AISAC) (Primary Coordinating Agency)

The Arizona Invasive Species Advisory Council (AISAC) was created, by Executive Order 2005-09, on April 1, 2005. AISAC was established under the joint leadership of the Arizona Game and Fish Department and Arizona Department of Agriculture to develop a consensus vision for a coordinated, multi-stakeholder approach to invasive species management in Arizona. This Governor appointed advisory council (not to exceed 27 members) was tasked to develop recommendations on how to coordinate between private, local, tribe, state, and federal entities on invasive species management efforts and issues for the State of Arizona. AISAC submitted recommendations to the Governor entitled: Arizona's Invasive Species – Unwanted Plants and Animals to the Governor on June 30, 2006. AISAC was reconvened by Executive Order 2007-07 on January 24, 2007, and the 21-member Council tasked with developing a statewide invasive species strategic plan by June 30, 2008. AISAC continues to meet on a semi-annual basis, with emphasis on the Arizona Center for Invasive Species (“The Center”, <http://az.gov/invasivespecies/>) and categorical work groups, such as the coordination & funding work group. This work group has been and will continue to be instrumental in the development and continued refinement of future invasive species management plans in the Southwest.

Arizona Game and Fish Department (AGFD) (Primary Coordinating Agency)

Currently the state restrictions concerning the regulation of AIS are based on A.R.S. 17-255 (AIS Interdiction Act of 2009). This state statute provides for powers and authorities concerning aquatic invasive species lists, affected waters, decontamination protocols, and violation/enforcement capacities. R12-4-313 and R12-4-316 both deal with the transport of baitfish, while R12-4-401 lists a number of restricted species, in regard to their movement and sale. This restricted list deals with many non-indigenous species, while R12-4-406 specifically lists the zebra mussel and quagga mussel as restricted.

Arizona Department of Agriculture (ADA) (Primary Coordinating Agency)

The ADA is mandated in the protection of state, private, and public lands from a number of terrestrial and aquatic noxious weeds. A.A.C. R3-4-244 lists regulated and restricted noxious weeds that are present in the state and are being monitored or controlled. A.A.C. R3-4-245 lists

prohibited noxious weeds that may not be transported into the state. Both of these laws include several threatening AIS. A.R.S. 3-201.01 gives the jurisdiction to control noxious weeds to the Arizona Department of Agriculture. This includes the right to quarantine areas, to call on land-owners to control noxious weeds and to update the noxious weeds list as necessary. A.R.S. 205.01 allows the ADaG to establish or approve programs to treat, spray, control, suppress or eradicate noxious weeds.

Environmental Services Division performs feed, fertilizer, pesticide and seed label inspections, sampling, registration and licensing to ensure compliance with state and federal laws and ensures consumers are protected. This Division is also charged with ensuring seed quality and seed free of noxious weeds; enforces pesticide use regulations to ensure products are applied according to label directions; established buffer zones are adhered to, and environmental and human concerns are protected; assures competency of pesticide applicators, pest control advisors and pesticide safety trainers through training, testing and certification; protects agricultural workers and pesticide handlers on agricultural establishments by enforcing state and federal agricultural safety regulations; conducts criminal investigations of native plant and livestock law violations through the Office of Special Investigations; and provides specialized enforcement and response support to divisions within the department.

Plant Services Division safeguards agriculture, food and the environment from the risks associated with the entry, establishment and spread of plant pests, diseases and noxious weeds, thereby promoting agricultural sustainability, market access and competitiveness; enforces state and federal quarantine regulations to ensure agricultural, environmental and public concerns are protected; conducts inspections throughout the state to enforce regulations on the importation, export and movement of plant materials; and conducts early detection surveys for the presence of exotic plant pests and diseases of concern to Arizona agriculture and its public in order to offer the best chance at successful eradication.

The University of Arizona (UA) (Primary Coordinating Agency)

The UA has a long-standing interest in AIS in the state and has worked with and offered advice to AGFD in the construction of this and previous versions of the AIS Management Plan. Because the problem of AIS is multi-faceted, understanding of and managing for them will require a multi-disciplinary approach, the UA has experts in many disciplines capable of addressing the issues with AIS. Departments include the School of Natural Resources and the Environment (with Academic Programs in Wildlife and Fisheries Management and Watershed Management); Hydrology and Water Resources; the Water Resources Research Center; and Soil, Water, and Environmental Sciences. Additionally, the UA can serve as a scientific clearing house of information regarding life history and environmental conditions needed for the growth and spread of AIS. This information is vital in understanding how to manage for and prevent the introduction and spread of AIS.

Other state universities providing valuable assets in AIS research include Arizona State University (ASU) and Northern Arizona University (NAU).

Arizona Department of Environmental Quality/Water Quality Division (ADEQ)

The core responsibilities of ADEQ's Water Quality Division include:

- ensuring that Arizona's public water systems deliver safe drinking water;
- identifying water pollution problems and establishing standards to address them;
- investigating complaints and violations of Arizona's water quality laws, rules and permits;
- issuing permits to protect Arizona waters from point sources of pollution;
- managing the quality of water resources through partnerships within the natural boundaries of the state's watersheds;
- monitoring and assessing the quality of surface and groundwater throughout the state; and regulating the discharge and treatment of wastewater.

Although ADEQ has no mandate to control AIS, the spread of AIS within the state has the potential to disrupt several core responsibilities within the Water Quality Division.

Arizona Department of Transportation (ADOT)

ADOT's Environmental Planning Group (EPG) evaluates highway projects for invasive weeds, and prescribes mitigation measures to remove and prevent introduction of such species. In addition, EPG evaluates projects for impacts to protected native plants per the Arizona Native Plant Law. According to Arizona law, the ADOT has administrative jurisdiction of transportation safety programs, and likewise must implement them in accordance with applicable law (See A.R.S. § 28-332[B]). This authority allows the ADOT to take appropriate action according to applicable governing law to preserve and protect the state transportation system from harm caused by invasive species.

Arizona State Land Department

Two Cooperative Weed Management Areas (CWMA) have been established to focus on the on-the-ground actions. Each group has identified species of concern, selected areas of concern and are in the process of developing and implementing action plans.

AIS MANAGEMENT STRATEGY:

Objectives, Actions, Strategies, and Cost Estimates

The goal of the Arizona AIS Plan (AzAIS) is to preclude or minimize the potentially harmful ecological, economic, human health, and social impacts resulting from the presence of AIS in Arizona through prevention and management of introduction, population growth, and dispersal into, within, and from Arizona. To achieve this goal the following actions are proposed:

- Secure an executive order from the Governor recommending full participation of involved state agencies in the re-initiation of the Arizona Invasive Species Advisory Council (AISAC);
- Secure appropriated funding capabilities through the state legislature to support an AIS program, including the expansion of law enforcement capacity and authority;
- Maintain a state-level Aquatic Invasive Species Program Coordinator (Coord) position;
- Maintain a database (currently iMapInvasives) for cataloging AIS in the state;
- Maintain and further develop a system to rank AIS based on threat level;
- Develop a monitoring system for documenting the presence and distribution of AIS in the state;
- Prevent the movement of AIS into and within Arizona
- Minimize the impact of established AIS on native biota, ecosystems, and the public;
- Devise a rapid-response system for detecting, investigating, and eradicating newly reported AIS or populations;
- Organize educational and outreach efforts to increase public awareness of AIS interdiction;
- Establish a system to coordinate AIS management efforts between state, federal, tribal, regional, and local agencies, and private organizations; and
- Outline research goals and mechanisms to fund management efforts.

The parties supporting this strategy understand that it is a non-binding statement of consensus. This plan is intended as a general understanding and agreement on how to approach AIS management in Arizona. This strategic plan is an attempt to coordinate individual efforts into a more comprehensive AIS management program, where the sum of collective efforts ends up greater than sum of the parts. A cooperative, concerted effort will result in a win-win situation for the economy, environment and the citizens of Arizona. Strategies and actions outlined in this plan include various agencies, but in no way mandate their participation. The AzAIS management plan is to be used as a guide; ultimately, funding and resource availability will likely be what delineates what actions are taken, and by whom.

It is not possible to address all potential AIS, their impacts, and the constraints and contingencies that may develop. Consequently, the AzAIS is intended to be adaptable to changing circumstances. Although all strategies and actions identified in this plan are important, AISAC support and future funding for the state aquatic invasive species program are critical for the effective management of AIS in Arizona. Activities and priorities of the AzAIS plan will be under continual review. An annual report may be produced by AISAC, which will include

recommendations for updating and modifying management activities and priorities. Ultimately, the Coordinator will oversee all initiatives of the AzAIS.

When used under the *Recommended Strategies and Actions* to achieve plan *Objectives*, the term “State” refers to the ADA, AGFD, AISAC, and UA. Other state agencies are listed parenthetically where their expertise is considered useful to achieve specific plan *Objectives* (e.g., State [ADEQ, ADOT]). The term “Fed” refers to the Bureau of Reclamation (BOR), Bureau of Land Management (BLM), US Army Corps of Engineers (CoE), Department of Agriculture (DOA), USDA- Animal and Plant Health Inspection Service (USDA-APHIS), Environmental Protection Agency (EPA), US Forest Service (USFS), US Fish and Wildlife Service (USFWS), US Geological Survey (USGS), and US National Park Service (NPS). A non-governmental organization (NGO) is a non-profit, legally constituted organization created by private persons or organizations with no participation or representation of any government. The term “municipalities” (MUN) includes entities of governance by counties and cities. The term “Private” may include, but is not necessarily limited to: citizens, business, lake associations, outdoor recreation groups, watershed groups, marinas, etc. Objectives and strategies are clearly labeled in the following sections; those portions of text following strategies containing the letter A plus a number are in place to outline corresponding actions per overall strategy.

OBJECTIVE 1: Coordinate and Implement a Comprehensive AIS Management Plan

Problem Addressed: Threats posed by AIS have not been recognized by agencies or adequately addressed in Arizona. Although adverse impacts from AIS in Arizona may not have been seen on a large scale yet, proactive measures are needed to prevent new introductions and further damage from occurring. There is no clear state authority or agency charged with limiting and managing AIS. When the issue is undertaken, most management activities are focused on isolated problems and do not approach AIS in a comprehensive, interagency manner. The lack of coordination, oversight, and funding has allowed many invasive species to become established in Arizona and permits new introductions.

Establishment of AzAIS with appropriate implementation, authority and resources will permit effective prevention and management of AIS. Most importantly, native species and their habitats, in addition to the state’s ecologic and economic resources, can be protected from the negative impacts of AIS.

Current Agency Activities

Arizona Game and Fish Department

Since the late 1990’s, the AGFD has represented the State of Arizona on the Western Regional Panel (WRP) of the Aquatic Nuisance Species Task Force (ANSTF) and the 100th Meridian Initiative. AGFD AIS activities to date have included, but not limited to: attending annual WRP meetings; elected member of the WRP Executive Board; member of the ANS Task Force’s ad hoc Grass Carp Team; annual correspondence with the WRP and ANSTF regarding

agency and state-level AIS actions; Co-Chair and lead facilitator of AISAC; development and distribution of AIS outreach materials and signage (e.g., “Stop Aquatic Hitchhikers”, “Don’t Move a Mussel”) to NPS, USFS-Tonto, and Arizona State and County Parks land managers (boat ramps, public fishing access points). AGFD acted as the lead agency in providing expertise in the development and implementation of Arizona’s AIS Interdiction Act of 2009 - HB2157 (now A.R.S. 17-255) and in the writing, development and finalization of this Arizona State Aquatic Invasive Species Management Plan.

United States Fish and Wildlife Service

In 2001, the FWS Southwest (Region 2) ANS Coordinator initiated contact with State agencies to increase the awareness of existing and potential AIS issues in Arizona. Since then the Coordinator has served an influential role directing and supporting current efforts towards development of the AzAIS, implementation of prevention and early detection programs, and dissemination of public information and outreach materials.

Gaps in State Management Programs and Authorities

- Many of these authorities are unclear in their scope or means of application.
- Although AGFD has some broad authorities, there is no single agency in Arizona State Government designated with an overall mandate to develop and implement AIS management .
- Activities are insufficiently coordinated in the state and within the region.
- Lack of funding results in staffing shortages and unaccomplished projects.
- ADEQ, ADOT, ADHS, and ADWR are not involved in AIS monitoring.

Recommended Strategies and Actions

The suggested lead stakeholder(s) for each action is indicated in parentheses. Designation of responsible parties will need to be determined jointly among cooperating entities and may be subject to change. Each action will require cooperation, collaborations and participation of state and federal agencies, the Tribes, municipalities, private industry, and public interest groups.

Strategy 1A: Coordinate all AIS management programs and activities within Arizona.

Action1A1. Re-establish the Arizona Invasive Species Advisory Council (AISAC) (Gov, State, Tribes, Fed, NGO, Private, MUN, WMD) and include aquatics-specific working group(s).

Action1A2. Create an Aquatic Invasive Species Coordinator (Coord) position and related programs. Detailed responsibilities and authorities pertaining to the coordinator position are to be decided by the aquatics working group, with a focus on efficiently synchronizing the AIS plan and AIS issues with the Arizona ISMP.

Action1A3. Identify and coordinate with key personnel in state, federal and tribal governments, and private, MUN and WMD entities for AIS responsibilities. (Gov, Coord, AISAC, State, Tribes, Fed, NGO, Private, MUN, WMD)

Action1A4. Develop a list of all established aquatic invasive species present in Arizona and develop management strategies for dealing with them as listed by priority class. (Coord, AISAC)

Action1A5. Establish standardized AIS inspection and decontamination protocols. (Coord, AISAC)

Action1A6. Develop an AIS abatement training course to teach removal and management methods, such as Watercraft Inspection Training (WIT) levels I and II. Courses as supplementary training for AIS personnel. (Coord, AISAC)

Action1A7. Develop AIS assessment guidelines as needed for federal state, tribal and local government or other governing bodies. (Coord, AISAC)

Action1A8. Conduct an annual forum focused on AIS in Arizona to update current status and potential management alternatives. Forum is to be optimized to streamline open communication between local, state, federal agencies, universities (research), NGO's, and the public (Coord, AISAC, Fed).

Strategy 1B: Participate in and support regional, federal, and international efforts to control AIS.

Action1B1. Participate in the ANS Task Force's WRP. (Coord, AISAC)

Action1B2. Support the 100th Meridian Initiative. (Gov, Coord, AISAC)

Action1B3. Coordinate with neighboring US and Mexican states on AIS issues, and develop shared-basin AIS initiatives. (Gov, Coord, AISAC,)

Strategy 1C: Increase existing funding and resources for AIS management and establish new funding and resources.

Action1C1. Pursue stable funding sources for AIS management in Arizona by seeking federal grants, state funding, and other available sources. (Coord, AISAC, State, Tribes)

Action1C2. Develop partnerships with private groups and business entities with a vested interest in AIS abatement to fund prevention and eradication efforts. (Coord, AISAC, State, Tribes, Fed, NGO)

Strategy 1D: Review and evaluate State efforts addressing AIS.

Action1D1. Conduct a periodic assessment of AIS species presence and abundance in Arizona. (Coord, AISAC, State, Tribes, Fed, MUN, WMD)

Action1D2. Evaluate and update the AzAIS Plan as needed, with annual progress reports and a five-year program report. (Coord, AISAC)

OBJECTIVE 2: Prevent the Introduction of AIS into Arizona

Problem Addressed: There are many different pathways by which new species can arrive in Arizona. Species that provide sport fishing opportunities, erosion control, food, and aesthetic enjoyment have been intentionally brought to Arizona and released into the wild or escaped from private ponds or holding facilities. Humans may unintentionally introduce AIS through various recreational, economic development, and management activities. AIS in neighboring states and Mexico may disperse into Arizona by natural means, such as transport on animals or by range expansion.

Understanding how these pathways function as conduits for AIS into Arizona is critical for intercepting species and preventing introductions. Although, factors such as proximity to source populations of AIS and similarities in habitat requirements make it possible to assess some of the species which pose a threat of invading Arizona, little is known regarding most of the potential AIS and their pathways into the state. Yet, the most effective method to control AIS and their impacts is to prevent their introduction.

Implementation of a program that reviews and regulates which species are intentionally allowed into Arizona, and monitors the pathways by which species can be unintentionally transported into Arizona, is necessary to slow the rate at which new species become introduced or established. Under this program, provisions would exist for monitoring the pathways by which species can be intentionally transported into Arizona.

Current Agency Activities

Arizona Department of Agriculture

Through the annual nursery inspections, ADA maintains a program to inspect nurseries for plant pests. The ADA has the authority to declare a weed as noxious, in turn making sale, planting or distribution into or within the state illegal.

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Arizona Game and Fish Department

AGFD regulates the importation/exportation of all non-domesticated fish and wildlife into the state.

Gaps in State Prevention Programs and Authorities

- Lack of a state-coordinated AIS program with appropriate authority to design and implement a prevention program and lack of funding.
- Limited authority, funding, and staff to enforce laws relating to AIS.
- No coordinated inspection program among law enforcement authorities for trailered boats crossing state borders via major interstate traffic routes or watercraft in transit on intrastate transportation routes.
- Limited boat inspection or decontamination training for law enforcement.
- Limited inspection of watercrafts prior to launch into state waters during water-based activities (e.g., fishing tournaments, boating events, etc.).
- Limited collaboration between state authorities and the pet/aquarium industry to create public awareness of the problems of AIS and to prevent accidental and purposeful introductions.
- Limited enforcement or inspection and monitoring of aquaculture, private ponds and aquaria.
- Limited enforcement ability over mail order or internet sales of organisms.

Recommended Strategies and Actions

The lead agency for each action is indicated in parenthesis. Each task will require coordination, collaboration, and participation of other state and federal agencies, tribal authorities, private industry, and public interest groups.

Strategy 2A: Research and address potential AIS and their pathways of introduction.

Action2A1. Review existing AIS programs from other states and jurisdictions to evaluate their success in preventing adverse impacts from AIS. (Coord, AISAC)

Action2A2. Describe invasion pathways and identify high-risk waterbodies. (Coord, AISAC, Universities)

Action2A3. Maintain and update AIS ranking/priority system (Coord, AISAC, Fed)

Action2A4. Research imported plants (Coord, ADA, APHIS, Universities)

Action2A5. Create a list of prohibited AIS for distribution to agencies, enforcement authorities, MUN, and WMD. (Coord, AISAC, State, Tribes, Fed)

Action2A6. Develop and implement an inspection program for trailered boats and water-based equipment entering and traveling in Arizona. (Coord, AISAC, AGFD)

Action2A7. Establish a boat washing program to reduce AIS spread and investigate installing washing stations at public and tribal boat ramps. (Coord, AISAC, AGFD, NPS, USFWS)

Action2A8. Work with importers to identify and monitor the potential for importation practices that could introduce AIS into uncontrolled environments. (Coord, AISAC, , ADaG, AGFD, APHIS, Private)

Action2A9. Inform Governor, Legislature, and staff (administrators, managers, technical personnel) of agencies (state, federal, tribes, municipal), NGO, and private entities about AIS issues and pathways of introduction. (Coord, AISAC, State, Tribes, Fed)

Strategy 2B: Increase enforcement and awareness of existing laws controlling the transport, propagation, sale, collection, possession, importation, purchase, cultivation, distribution, and introduction of AIS.

Action2B1. Identify existing authorities for regulations and permitting processes to prevent the introduction and spread of AIS, including gaps in current rules, regulations, and policies. (Coord, AISAC, State, Tribes, Fed)

Action2B2. Based on gaps identified in 2B1, fund expansion of State regulatory authorities to increase prevention, control, and eradication of AIS in Arizona, as required by future needs assessment. (Gov, Leg)

Action2B3. Seek additional enforcement authority as needed to provide comprehensive permitting processes to prevent and control AIS introduction and spread. (Coord, AISAC, AGFD, ADA, Tribes)

Action2B4. Increase the priority for enforcing AIS laws. (All LE authorities: State, Tribes, Fed)

Action2B5. Train enforcement personnel on AIS identification, state regulations, and watercraft inspection and decontamination methods. (Coord, State, Tribes, Fed)

Action2B6. Distribute information on AIS laws to businesses that import or sell aquatic organisms. (Coord, State, Tribes, Fed)

Action2B7. Increase awareness of existing penalties for the intentional introduction of any aquatic invasive species to Arizona's waters. (Coord, AISAC, State, Tribes, Fed)

Action2B8. Assess efficacy of existing AIS regulations and penalties and revise when necessary. (Coord, AISAC, State, Tribes)

Strategy 2C: Promote legislation and regulations that establish or increase the state's authority to control the introduction of new species.

Action2C1. Establish the authority to stop, inspect, detain, and require cleaning of any vehicle, vessel or water-based equipment containing or infested with AIS that is traveling in Arizona. (Gov, Leg, State, Tribes)

Action2C2. Increase the ability of the State to regulate the importation of aquatic organisms. (Gov, Leg, State, Tribes)

Action2C3. Establish the authority to quarantine suspected AIS vessels, introduction points (Gov., Leg., State, Tribes, Fed)

Action2C4. Establish precedents for disease and pest free importation of species into Arizona (Gov, Leg, State, Tribes, Fed)

Action2C5. Develop or amend existing cooperative agreements with adjacent states, including Mexican states, sharing common waters to address AIS. (Gov, Leg, Coord, adjacent states [CA, NM, UT, NV, Sonora]).

OBJECTIVE 3: DETECT AND ERADICATE PIONEERING AQUATIC INVASIVE SPECIES.

Problem Addressed: When an invasive species arrives there is often a window of opportunity to eradicate small pioneering populations before they become established or expand beyond an isolated location. However, AIS are often not detected until nuisance populations are formed, or in some instances response times are delayed, allowing populations to increase rapidly. Usually, it is too late or too expensive to eradicate a species once it has reached a nuisance level, and when management is conducted after a population is well-established, costly long-term monitoring activities will be required to control the population and reduce economic and environmental impacts.

By initiating a monitoring program and rapid response plan, the State will be able to detect and manage pioneering infestations at a point when the species can be eradicated in the most cost-effective manner. An effective monitoring program requires a cooperative network among stakeholders, supportive laws, and permanent funding.

Current Agency Activities

Arizona Department of Agriculture

The ADA monitors the importation of plant material and other agriculture commodities that could potentially contain or be contaminated with a noxious weed, including but not limited to pond supply outlets and retail nurseries. The ADA also responds to reports of possible noxious infestations and evaluates potential impacts of their introduction.

Arizona Game and Fish Department

The AGFD regulates the take, transport, movement of wildlife and fish within and across the state boundary and actively manages some naturalized AIS and pioneering populations that

may affect native wildlife. Staff of the AIS Program (located within the Habitat Branch of the Wildlife Management Division) have been tasked with monitoring, documenting and tracking potential and listed invasive species (refer to Priority 1, 2 and 3 AIS), and actively manage their control (containment, eradication) and movement. AGFD also is the lead agency responsible for watercraft registration and enforcement in Arizona, thus the connection between watercraft movement and AIS infestation.

Arizona Department of Environmental Quality

ADEQ conducts surveys to monitor water quality for factors that contribute to impairment and undesirable aquatic life. These surveys include biological monitoring that could potentially address AIS concerns. See Standards for Interstate and Intrastate Surface Waters.

United States Fish and Wildlife Service

The U.S. Fish & Wildlife Service monitors aquatic habitat in Arizona through an Arizona Fish and Wildlife Conservation Office (AZFWCO), located in Pinetop, Arizona. Various field stations assist AZFWCO in monitoring and habitat restoration activities. A national reporting hotline (877-STOP-ANS) is maintained through a partnership with the U.S. Fish & Wildlife Service, U.S. Geological Survey, and The University of Texas at Arlington. This hotline provides a live person to collect pertinent information from the public 24 hours a day, seven days a week, including holidays. The U.S. Fish & Wildlife Service is also a founding member of the Lower Colorado River Aquatic Nuisance Species Task Force, and is actively involved in controlling and eradicating Giant salvinia in the lower Colorado River. Gaps in State Monitoring and Eradication Programs and Authorities

- Current AIS monitoring efforts are inadequate. Authority to quarantine is not practical in Arizona and not comprehensively available for all potential AIS.
- Funding to quickly deal with new AIS is lacking, thus response time to an invasion will be slow due this lack of funding and any contingency plans.
- Surface water quality standards lack biological criteria for impairment due to AIS.

Recommended Strategies and Actions

Strategy 3A: Implement a surveillance and early detection program.

Action3A1. Identify high-risk water bodies. (Coord, AISAC, State, Tribes, Fed, NGO, Universities)

Action3A2. Develop and fund a monitoring and surveillance program for high-risk AIS.(Coord, AISAC, State, Tribes, Fed)

Action3A3. Conduct annual monitoring and surveillance of high-risk water bodies and associated water delivery infrastructure(s). (State, Tribes, Fed, MUN, WMD)

Action3A4. Encourage and train citizen-based monitoring networks to work in cooperation with state and federal agencies and tribal entities. (Coord, ASIAC, State, Tribes, Fed, NGO, Private)

Strategy 3B: Develop an early response mechanism to deal with detected and potential AIS.

Action3B1. Develop a Rapid Response Plan for AIS species. (Coord, AISAC)

Action3B2. Implement Rapid Response Plan for AIS species. (Coord, State, Tribes, Fed, Private)

Action3B3. Develop targeted HACCP plans to address the spread of AIS. (Coord, AISAC, State, Tribes, Fed)

Strategy 3C: Eradicate pioneering populations of AIS.

Action3C1. Develop an eradication program for AIS in early stages of invasion. (Coord, AISAC)

Action3C2. Implement an eradication program for AIS in early stages of invasion. (Coord, AISAC, State, Tribes, Fed)

OBJECTIVE 4: Where Feasible, Control or Eradicate Established AIS that Have Significant Impacts

Problem Addressed: Once established, AIS often create very noticeable impacts, yet they are often impossible to eradicate or control. Management activities are most economically effective when they are directed at limiting the impacts of a population or stopping that population from spreading to new water in Arizona and the West.

In situations where AIS have previously invaded, management activities must focus on situations where there is a clear and significant impact on local economies, native species, and where the control or eradication of specific populations is economically and technically feasible.

Current Activities

Arizona Department of Agriculture

ADA monitors for agricultural and invasive pests and plants. The Department has the authority to quarantine, treat, eradicate, destroy or have removed from the state an aquatic noxious weed or other AIS that is regulated by the Department.

Arizona Game and Fish Department

The AGFD regulates the movement of wildlife and fish species within and across the state boundary and actively manages some naturalized and pioneering AIS populations that may affect native aquatic wildlife and important fisheries. With proper public input and knowledge,

nonnative fish removal is used as a technique to protect native fish populations, endangered fishes, and important sport fisheries.

Gaps in State Control and Eradication Programs and Authorities

- The State does not have a clear program or Agency directed at controlling or eradicating AIS.

Recommended Strategies and Actions

Strategy 4A: Limit or eradicate the dispersal of established AIS into new waters or into new areas of a water body or drainage.

Action4A1. Establish watercraft decontamination protocols to reduce AIS spread and investigate installing wash stations at public boat ramps (See 2A6). (Coord, State, Fed, Tribes)

Action4A2. Limit the spread of existing AIS by reducing the access to existing populations through the use of warning signs, buoys, and possible temporary closures in and around affected, infested areas. (Coord, State, Tribes, Fed, Private)

Action4A3. Include AIS information on signs and kiosks at affected waters. (Coord, State, Tribes, Fed)

Action4A4. Implement management programs to control Priority Class 2 and 3 species. (State [ADA, AGFD, Tribes, Fed])

OBJECTIVE 5: Increase and Disseminate Knowledge of AIS in Arizona through Data Compilation and Research

Problem Addressed: Little is known about the extent and magnitude of the AIS problem in Arizona. In fact many more non-indigenous species probably occur in Arizona than are recognized. First, it is essential to determine the extent of the AIS problem within the state. Information on the number, taxonomy, and distribution of AIS in Arizona is spread currently across several data sources, often with inconsistencies, thus making it difficult to assess the situation. This information needs to be compiled and organized under one database that is readily and easily accessible to agency personnel and the public. A centralized “hotline” system for reporting the presence of AIS needs to be developed, which is coordinated with a rapid response system. Research should be implemented on the biology of AIS and their impacts on native species and habitats. Additionally, new methods of control and eradication for established AIS need to be pursued in coordination with other state and federal agencies, and research institutions.

Current Agency Activities

Arizona Department of Agriculture

The Department administers the state noxious weed list found in A.A.C. R3-4-244 and R3-4-245. Any infestation of a federally regulated aquatic noxious weed is reported to USDA-APHIS.

Arizona Game and Fish Department

AGFD currently administers the Aquatic Invasive Species Program in Arizona, per HB2157 and A.R.S. 17-255. This includes development, administration, and implementation of: AIS Directors Order 1 (AIS listing; AIS Directors Order 2 (AIS affected waters listing); AIS Director's Order 3 (Mandatory conditions for watercraft/equipment movement from listed affected waters), and; Statute violations and law enforcement capacities. AGFD also administers the invasive species database (terrestrial and aquatic; [iMapInvasives Arizona](#)), chosen by AISAC, and the main website for invasive species information exchange in Arizona (the Arizona Center for Invasive Species), also initiated by AISAC. However, AGFD has very limited capability and funding for continuing these endeavors, including future data compilation and research activities.

Federal Agencies

Numerous federal agencies (e.g., USFWS, USGS, USDA) and other agencies compile lists of AIS, invasive species, and weeds.

Gaps in State Programs and Authorities

- Incomplete knowledge of the number and distribution of AIS.
- Poor understanding of the basic biology and impacts of AIS.
- Management options are limited.
- Limited funding is available to conduct research and management activities.

Recommended Strategies and Actions

Strategy 5A: Facilitate the collection and dispersal of information, research, and data on AIS in Arizona.

Action5A1. Maintain and coordinate the central database and repository of information (currently the Arizona Center for Invasive Species website) on AIS in Arizona. (Coord, AISAC, Universities, Fed)

Action5A2. Build and maintain a database (currently iMapInvasives Arizona) on AIS in Arizona which is coordinated with other relevant websites and agencies. (Coord, Universities, Fed)

Action5A3. Utilize existing field personnel to document the distribution and abundance of AIS. (State, Tribes, Fed, Universities)

Action5A4. Develop and maintain a list of taxonomic experts for AIS identification which is coordinated with national and regional lists of experts. (Coord, AISAC, Universities)

Strategy 5B: Research AIS for their impact on native biota utilizing regional efforts & literature searches.

Action5B1. Develop a better understanding of life histories and impacts of introduced aquatic plants and animals. (Coord, State, Tribes, Fed, Universities)

Action5B2. Continue to monitor native aquatic biota, including species most likely to be impacted by AIS. (State, Tribes, Fed, Universities)

Action5B3. Evaluate the potential for aquarium pets, live food fish, hatchery stock, and shellfish to serve as vectors of disease and parasites to humans and native aquatic wildlife. (Coord, State, Tribes, Fed, Universities)

Strategy 5C: Research alternative management techniques for their effect on AIS and native species.

Action5C1. Investigate the relationship between human-induced disturbance of aquatic and riparian systems and AIS invasion, establishment, and impacts. (Coord, State, Tribes, Fed, Universities)

Action5C2. Investigate and develop new and innovative methods of managing AIS. (Coord, State, Tribes, Fed, Universities)

Action5C3. Evaluate herbicide and pesticide effects. (Coord, State, Tribes, Fed, Universities)

OBJECTIVE 6: Inform the Public, Policy Makers, Natural Resource Workers, Private Industry, and User Groups about the Risks and Impacts of AIS

Problem Addressed: The lack of awareness concerning AIS impacts is one of the largest management obstacles. Few people understand the threat alien species pose and the role humans play in the transport and introduction of all invasive species. Un-informed people, through the dumping of an aquarium or a bait bucket, launching of a contaminated boat, or stocking of a private pond, have introduced and spread many AIS in North America. The improper importation and holding of organisms has allowed species to escape, or caused the receipt of unwanted organisms mixed in with intentionally imported ones. Many policymakers, natural resource administrators, and private interest groups have facilitated the intentional introductions of species for certain economic or recreational purposes without understanding the effects these

species would have on native species. Introductions, either intentional or unintentional, can be eliminated or curtailed by educating people of their potential to transfer non-indigenous species to Arizona. It is not only important to prevent the spread of AIS species within the state, but also prevent the spread throughout shared drainages with adjacent states. The potential spread of AIS within and among these basins can adversely affect native biota, ecosystems, and regional economies. It is critical to inform people about the risks and impacts of AIS.

Current Agency Activities

Arizona Game and Fish Department

AGFD has taken the lead in developing and distributing “Stop Aquatic Hitchhikers” and “Don’t Move a Mussel” signage (boat ramp) and other outreach materials at public access points on state and federal lands throughout the State. AGFD has also held various public meetings, forums and webcasts throughout the State over the past three years to further inform the public in AIS abatement and containment. AGFD has hired and trained various interns over the past two summers to directly talk with boaters on public ramps concerning quagga mussel interdiction, outreach and watercraft decontamination. In 2009, AGFD was successful in providing expertise in the eventual passing of HB2157 (A.R.S. 17-255), the AIS Interdiction Act.

Gaps in State Education Programs and Authorities

- AIS education and outreach has not garnered the attention of legislators, policymakers, and government administrators.
- Due to lack of funding and manpower considerations, insufficient AIS information is disseminated to the public.
- Few natural resource workers have the training to identify AIS and/or decontaminate watercraft and equipment effectively.
- Little information is available to agency and private personnel about AIS.

Recommended Strategies and Actions

Strategy 6A: Inform the public about AIS, and how their actions can help prevent the spread and reduce the impacts of AIS.

Action6A1. Incorporate AIS information into boat operator and hunter/aquatic education classes. (AGFD)

Action6A2. Create an educational curriculum on AIS for schools. (Coord, AISAC, State, Tribes)

Action6A3. Distribute information on AIS at various state museums, conferences, shows, tournaments, public gatherings, and sporting goods vendors, via a “Traveling trunk” means. (Coord, State, Tribes, Fed, Private)

Action6A4. Produce press releases and public service announcements (PSAs) on specific AIS. (Coord, AISAC, State [AzGFD Tribes, Fed])

Action6A5. Produce articles, videos, billboards, and web media regarding AIS (Coord, AISAC, Fed, NGO's)

Action6A6. Distribute produced articles, videos, etc (Coord, AISAC, Fed, NGO's)

Action6A7. Include information on AIS in state hunting, fishing, and boating regulations. (AGFD)

Action6A8. Develop a "Arizona-friendly" plant labeling system in conjunction with the nursery industry. (Coord, ADA)

Action6A9. Inform policymakers on the extent, impact, and potential for harm of AIS. (Coord, AISAC, State, Tribes, Fed)

Action6A10. Expand statewide participation and partnerships by networking with national public education campaigns (Stop Aquatic Hitchhikers, Protect Your Waters, Clean Angling Coalition, Habitattitude™) to increase awareness of AIS issues, to disseminate educational material, and to foster responsible management of unwanted pets. (Coord, AISAC, State, NGO, Private)

Action6A11. Develop working relationships with sporting groups and conservation organizations to foster outreach and educational activities relating to AIS, including providing information, training, and incentives for AIS-related activities which help prevent the spread of AIS. (Coord, AISAC, State, Tribes, Fed, NGO, Private)

Strategy 6B: Train natural resources personnel in AIS identification.

Action6B1. Conduct identification seminars for field personnel of state, federal, tribal, and municipal governments. (Coord, State, Tribes, Fed, Universities)

Strategy 6C: Inform private industry on AIS identification, their effects, and the laws regulating them.

Action6C1. Create and distribute pamphlets for the nursery industry, pet stores, bait dealers and other relevant businesses identifying AIS, the laws regulating them, and their affects on natural systems. (Coord, State, Fed)

Action6C2. Provide information on AIS to fishing tournament organizers. (Coord, AGFD, Fed)

Action6C3. Identify and provide AIS information to all other persons or businesses operating on waters in and bordering Arizona. (Coord, State, Tribes, Fed, Private)

Priorities for Action

AIS concerns were addressed relative to the species prioritization scheme on pages 16 through 19. Those concerns ranked highest shall warrant the most immediate attention and actions; this aforementioned prioritization scheme was developed to aid in targeting the most important species and instances of invasion and to best utilize resources considering scientific information, budgetary effectiveness, and manpower capacities. These proposed actions also took into consideration non-species priorities, such as likelihood of public compliance and/or participation with respect to recovery efforts and procedures. See 'Potential Impacts and Threat Score' (page 17) and those priority listings for future actions to be implemented by this plan. Prioritizing in this manner takes into account the optimization of how efforts, budgets, and manpower are allocated toward management and recovery efforts based on the most current scientific knowledge.

IMPLEMENTATION TABLE

The following table identifies various strategies and actions (tasks and responsibilities) of stakeholders. Granting and funding estimated requirements to carry out these proposed actions were developed in conjunction with assessments from stakeholders and cooperating State and Federal agencies. In general, funds for implementing the Arizona Aquatic Invasive Species Management Plan will be administered through the State Invasive Species Coordinator(s) as a member of the Arizona Invasive Species Advisory council and the Western Regional Panel of the Aquatic Nuisance Species Task force. For clarification, objectives are listed, then strategies. Below each strategy, actions are delineated in the leftmost column, abbreviated as 1A1, 1A2, etc.

Strategies/Actions		Implementing Entities and Cooperating Organizations	Funding (in thousands) and Personnel Needs (FTE's)										
Task ID #	Task Name or Description		FY 12 and FY 13 {funds/FTE's per year}					FY 14 and FY 15 {funds/FTE's per year}					
			State Funds		Federal Funds (U.S.)		Total	State Funds		Federal Funds (U.S.)		Total	
			Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$	Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$	
Objective 1: Coordinate and implement a comprehensive management plan.													
Strategy 1A: Coordinate all AIS management programs and activities within Arizona													
1A1	Re-establish AISAC	Governor's Office, State, Tribes, Fed, Muni, NGO, Private, Universities	AGFD,	ADA	3K (0.2)	FWS, FS	NA	>3K	AGFD, ADA	3K (0.2)	FWS, FS	NA	>3K

Strategies/Actions		Implementing Entities and Cooperating Organizations	Funding (in thousands) and Personnel Needs (FTE's)									
Task ID #	Task Name or Description		FY 12 and FY 13 {funds/FTE's per year}					FY 14 and FY 15 {funds/FTE's per year}				
			State Funds		Federal Funds (U.S.)		Total	State Funds		Federal Funds (U.S.)		Total
			Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$	Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$
1A2	Create/Fund AIS Coord(s) Programs	AISAC, State, Fed, Muni, NGO, Private	AGFD, ADA	300K (1)	FWS, FS, BLM, NPS, Private,	120K	420K	AGFD, ADA	350K (1.5)	FWS, FS, BLM, NPS, Private	450K	800K
1A3	Identify & coordinate with federal, tribal & private support staff	AISAC, AIS Coord, Tribes, Fed, Muni, NGO, Private,	AGFD, ADA	Low (<0.1)	FWS,FS, BOR, BLM, NPS	NA	Low	AGFD, ADA	Low (<0.1)	FWS,FS, BOR, BLM, NPS	NA	Low
1A4	State AIS list	AIS Coord, AISAC	AGFD, ADA	Low (<0.1)	NA	NA	Low	AGFD, ADA	Low (<0.1)	NA	NA	Low
1A5	AIS inspection & decon protocols	AIS Coord, AISAC, Fed, Tribe, Muni, Private	AGFD, ADA	Low (<0.1)	FWS, FS, BLM, NPS	Low	Low	AGFD, ADA	Low (<0.1)	FWS, FS, BLM, NPS	Low	Low
1A6	AIS abatement training course(s)	AIS Coord, Fed, Tribe, Muni, Private	AGFD, ADA	6K (0.2)	FWS, FS, BLM, NPS	30K	36K	AGFD, ADA	6K (0.5)	FWS, FS, BLM, NPS	35K	41K
1A7	AIS assessment guidelines	AIS Coord, AISAC	AGFD, ADA	3K (>0.1)	FWS, FS, BLM, NPS	10K	13K	AGFD, ADA	3K (0.2)	FWS, FS, BLM, NPS	10K	13K

Strategies/Actions		Implementing Entities and Cooperating Organizations	Funding (in thousands) and Personnel Needs (FTE's)									
Task ID #	Task Name or Description		FY 12 and FY 13 {funds/FTE's per year}						FY 14 and FY 15 {funds/FTE's per year}			
			State Funds		Federal Funds (U.S.)		Total	State Funds		Federal Funds (U.S.)		Total
			Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$	Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$
1A8	Annual AIS forum	AIS Coord, AISAC, Fed, Tribe, Muni, Private	AGFD, ADA	3k (>0.1)	Various	15K	18K	AGFD, ADA	5k (0.2)	Various	20K	25K
Strategy 1B: Participate in and support regional, federal, and international efforts to control AIS.												
1B1	Western Regional Panel	AIS Coord, AISAC	See 1A2									
1B2	100th Meridian Initiative	AIS Coord, AISAC	See 1A2									
1B3	Interstate & Mexican coordination	AIS Coord, AISAC,	See 1A2									
Strategy 1C: Increase existing funding resources for AIS management and establish new funding and resources.												
1C1	Pursue stable funding	AIS Coord, AISAC, Feds, Private, NGO's	AGFD, ADA	TBD	USFWS, FS, NPS, BLM	TBD	TBD	AGFD, ADA	TBD	USFWS, FS, NPS, BLM	TBD	TBD

Strategies/Actions		Implementing Entities and Cooperating Organizations	Funding (in thousands) and Personnel Needs (FTE's)									
Task ID #	Task Name or Description		FY 12 and FY 13 {funds/FTE's per year}					FY 14 and FY 15 {funds/FTE's per year}				
			State Funds		Federal Funds (U.S.)		Total	State Funds		Federal Funds (U.S.)		Total
			Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$	Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$
1C2	Develop private partnerships	AIS Coord, AISAC, State, Fed, Muni, Tribe	See 1A1 & 1A2									
Strategy 1D: Review and evaluate State efforts addressing AIS.												
1D1	Assess AIS status	AIS Coord, AISAC, Tribes, Fed, Private, NGO's	See 1A1 & 1A2									
1D2	Update Az IS & AIS Plans	Coord, AISAC	See 1A1 & 1A2									
Objective 1: Totals					155K (1.5)		175K	330K		367K (2.5)		515K 882K
Objective 2: Prevent the introduction of AIS into Arizona.												
Strategy 2A: Research and address potential AIS and their pathways of introduction.												
2A1	Review existing AIS programs	AIS Coord, AISAC, Fed, Private, Universities	AGFD, ADA, Universities	2K (<0.1)	FWS, FS, BOR, BLM, NPS, COE	NA	2K	AGFD, ADA, Universities	2K (>0.1)	FWS, FS, BOR, BLM, NPS, COE	NA	2K

Strategies/Actions		Implementing Entities and Cooperating Organizations	Funding (in thousands) and Personnel Needs (FTE's)										
Task ID #	Task Name or Description		FY 12 and FY 13 {funds/FTE's per year}						FY 14 and FY 15 {funds/FTE's per year}				
			State Funds		Federal Funds (U.S.)		Total	State Funds		Federal Funds (U.S.)		Total	
			Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$	Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$	
2A2	Invasion pathways & high-risk waterbodies	AIS Coord, AISAC, Fed, Universities	AGFD, ADA, Universities	50K (<0.1)	FWS, FS, NPS	200K	250K	AGFD, ADA, Universities	50K (0.2)	FWS, FS, NPS	250K	300K	
2A3	AIS ranking system	AIS Coord, AISAC, Fed	AGFD, ADA, Universities	2K (<0.1)	FWS, FS, NPS	NA	2K	AGFD, ADA, Universities	2K (<0.1)	FWS, FS, NPS	NA	2K	
2A4	Research imported plants	AIS Coord, ADaG, APHIS, Universities	ADA	5k (>0.1)	APHIS, FS	20K	20K	ADA	5k (0.2)	APHIS, FS	25K	30K	
2A5	Prohibited AIS list	AIS Coord, AISAC, State, Tribes, Fed	AGFD, ADA	5k (>0.1)	FWS, FS, BLM, NPS, APHIS	10K	15K	AGFD, ADA	5k (>0.1)	FWS, FS, BLM, NPS, APHIS	10K	15K	
2A6	Boat inspection program	AIS Coord, Tribes, Fed, Muni, Private	AGFD, ASP	20K (0.2)	FWS, FS, BLM, NPS	100K	110K	AGFD, ADA, ASP	30K (0.3)	FWS, FS, BLM, NPS	200K	230K	
2A7	Boat wash stations	AIS Coord, AISAC, BOR, Tribes, FWS, NPS, Private (marinas)	AGFD, ASP	50K (0.2)	FWS, FS, BLM, NPS, BOR, COE	200K	250K	AGFD, ASP	50K (0.2)	FWS, FS, BLM, NPS, BOR, COE	250K	300K	

Strategies/Actions		Implementing Entities and Cooperating Organizations	Funding (in thousands) and Personnel Needs (FTE's)									
Task ID #	Task Name or Description		FY 12 and FY 13 {funds/FTE's per year}					FY 14 and FY 15 {funds/FTE's per year}				
			State Funds		Federal Funds (U.S.)		Total	State Funds		Federal Funds (U.S.)		Total
			Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$	Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$
2A8	Work with transporter companies	AIS Coord, AISAC, , ADA, APHIS, Private	AGFD, ADA	2K (>0.1)	FWS, FS, BLM, NPS, APHIS	NA	2K	AGFD, ADA	2K (0.2)	FWS, FS, BLM, NPS, APHIS	NA	2K
2A9	Inform agency/org. staff	AIS Coord, AISAC, Tribes, Fed, NGO's, Private	AGFD, ADA	2k (>0.1)	FWS, FS, BLM, NPS, BOR, COE	5K	7K	AGFD, ADA	2K (>0.1))	FWS, FS, BLM, NPS, BOR, COE	5K	7K
Strategy 2B: Increase enforcement and awareness of existing laws controlling the transport, propagation, sale, collection, possession, importation, purchase, cultivation, distribution, and introduction of AIS.												
2B1	Identify regs. & permitting authorities	AIS Coord, AISAC, Fed, Tribes, NGO's	AGFD, ADA	2K (>0.1)	FWS, FS, NPS, BOR	10K	12K	AGFD, ADA	2K (>0.1)	FWS, FS, NPS, BOR	10K	12K
2B2	Expand state permitting program	Governor's office, AISAC, Legislature	AGFD, ADA	5K (>0.1)	NA	NA	5k	AGFD, ADA	5K (>0.1)	NA	NA	5K
2B3	Seek addl permitting authority	Governor's office, AISAC, Legislature	See 2B2									
2B4	AIS LE	All LE authorities: State, Fed	AGFD, ADA	25K	FWS, FS, NPS	50K	75K	AGFD, ADA	50K	FWS, FS, NPS	100K	150K

Strategies/Actions		Implementing Entities and Cooperating Organizations	Funding (in thousands) and Personnel Needs (FTE's)									
Task ID #	Task Name or Description		FY 12 and FY 13 {funds/FTE's per year}					FY 14 and FY 15 {funds/FTE's per year}				
			State Funds		Federal Funds (U.S.)		Total	State Funds		Federal Funds (U.S.)		Total
			Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$	Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$
2B5	Train LE personnel	AIS coord, all LE authorities, State, Fed	See 2B4									
2B6	Distribute information to importers	AIS Coord, State, Tribes, Fed, NGO's, Private	AGFD, ADA	25K (>0.1)	FWS, FS, BLM, NPS	50K	75K	AGFD, ADA	25K (>0.1)	FWS, FS, BLM, NPS	50K	75K
2B7	Publicize penalties	AIS Coord, State, Tribes, Fed	AGFD, ADA	5K (>0.1)	FWS, FS, BLM, NPS	5K	10K	AGFD, ADA	5K (>0.1)	FWS, FS, BLM, NPS	5K	10K
2B8	Examine regs & penalties	AIS Coord, AISAC, State, Tribes, Fed	AGFD, ADA	2K (>0.1)	FWS, FS, BLM, NPS	NA	2K	AGFD, ADA	2K (>0.1)	FWS, FS, BLM, NPS	NA	2K
Strategy 2C: Promote legislation and regulatory rules that establish or increase the state's authority to control the introduction of new species.												
2C1	Authority to detain	Governor's office, Legislature, State, Tribes, Fed	AGFD, ADA	2K (>0.1)	FWS, FS, BLM, NPS	NA	2K	AGFD, ADA	2K (>0.1)	FWS, FS, BLM, NPS	NA	2K
2C2	Increase import regulation	Governor's office, Legislature, State, Tribes, Fed	See 2C1									

Strategies/Actions		Implementing Entities and Cooperating Organizations	Funding (in thousands) and Personnel Needs (FTE's)									
Task ID #	Task Name or Description		FY 12 and FY 13 {funds/FTE's per year}					FY 14 and FY 15 {funds/FTE's per year}				
			State Funds		Federal Funds (U.S.)		Total	State Funds		Federal Funds (U.S.)		Total
			Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$	Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$
2C3	Authority to quarantine	Governor's office, Legislature, State, Tribes, Fed	See 2C1									
2C4	Disease & pest free imports	Governor's office, Legislature, State, Tribes, Fed	See 2C1									
2C5	Interstate & Mexican cooperative agreements	Governor's office, Legislature,Mexico, other States, Tribes, Fed	See 2C1									
Objective 2: Totals				210K (1.5)		450K	660K		250K		1.06 mil	1.31 mil
Objective 3: Detect and eradicate pioneering aquatic invasive species.												
Strategy 3A: Implement a surveillance and early detection program.												

Strategies/Actions		Implementing Entities and Cooperating Organizations	Funding (in thousands) and Personnel Needs (FTE's)										
Task ID #	Task Name or Description		FY 12 and FY 13 {funds/FTE's per year}						FY 14 and FY 15 {funds/FTE's per year}				
			State Funds		Federal Funds (U.S.)		Total	State Funds		Federal Funds (U.S.)		Total	
			Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$	Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$	
3A1	Identify high-risk waterbodies	AIS Coord, Tribes, Fed, NGO's, Universities	AGFD, ADA	2K (>0.1)	FWS, FS, BLM, NPS, BOR, COE	NA	2K	AGFD, ADA	2K (>0.1)	FWS, FS, BLM, NPS, BOR, COE	NA	2K	
3A2	Develop monitoring/surveillance program	AIS Coord, AISAC, Tribes, Fed, NGO's	AGFD, ADA, SRP, CAP	5K (>0.1)	BOR, BLM, NPS, FS	10K	15K	AGFD, ADA	5K (>0.1)	BOR, BLM, NPS, FS	15K	20K	
3A3	Conduct monitoring/surveillance of high-risk waterbodies & water delivery systems	AIS Coord, AISAC, Tribes, Fed, NGO's	AGFD, ADA, SRP, CAP	10K (0.2)	BOR, BLM, NPS, FS	150K	160K	AGFD, ADA, SRP, CAP	10K (0.2)	BOR, BLM, NPS, FS	200K	210K	
3A4	Encourage citizen-based monitoring	AIS Coord, AISAC, Tribes, Fed, NGO's, Private	AGFD, ADA, SRP, CAP	>1K (>0.1)	BOR, BLM, NPS, FS	NA	NA	AGFD, ADA, SRP, CAP	>1K (>0.1)	BOR, BLM, NPS, FS	NA	NA	
Strategy 3B: Develop an early response mechanism to deal with detected and potential AIS.													

Strategies/Actions		Implementing Entities and Cooperating Organizations	Funding (in thousands) and Personnel Needs (FTE's)									
Task ID #	Task Name or Description		FY 12 and FY 13 {funds/FTE's per year}						FY 14 and FY 15 {funds/FTE's per year}			
			State Funds		Federal Funds (U.S.)		Total	State Funds		Federal Funds (U.S.)		Total
			Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$	Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$
3B1	Develop Rapid Response/ Funding Plan	AIS Coord, AISAC, Fed, Tribes, NGO's	AGFD, ADA	3K (>0.1)	BOR, BLM, NPS, FS, COE	10K	8K	AGFD, ADA	3K (>0.1)	BOR, BLM, NPS, FS, COE	10K	13K
3B2	Implement Rapid Response Plan	AIS Coord, AISAC, Fed, NGO's	AGFD, ADA	3K (0.2)	BOR, BLM, NPS, FS, COE	5K	8K	AGFD, ADA	6K (0.2)	BOR, BLM, NPS, FS, COE	15K	21K
3B3	Develop HAACCP plans	AIS Coord, AISAC, Tribes, Fed, NGO's, Private	AGFD, ADA	3K (>0.1)	BOR, FWS, FS, BLM, NPS, COE	10K	13K	AGFD, ADA	3K (0.2)	BOR, FWS, FS, BLM, NPS, COE	10K	13K
Strategy 3C: Eradicate pioneering populations of AIS.												
3C1	Develop eradication program for pioneering AIS	AIS Coord, AISAC Tribes, Fed, NGO's, Private,	AGFD, ADA	5K (>0.1)	BOR, FWS, FS, BLM, NPS	10K	15K	AGFD, ADA	5K (0.2)	BOR, FWS, FS, BLM, NPS	10K	15K
3C2	Implement eradication program for pioneering AIS	AIS Coord, AISAC Tribes, Fed, NGO's, Private,	AGFD, ADA	10K (0.2)	BOR, FWS, FS, BLM, NPS	25K	35K	AGFD, ADA	15K (0.2)	BOR, FWS, FS, BLM, NPS	50K	65K

Strategies/Actions		Implementing Entities and Cooperating Organizations	Funding (in thousands) and Personnel Needs (FTE's)									
Task ID #	Task Name or Description		FY 12 and FY 13 {funds/FTE's per year}					FY 14 and FY 15 {funds/FTE's per year}				
			State Funds		Federal Funds (U.S.)		Total	State Funds		Federal Funds (U.S.)		Total
			Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$	Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$
Objective 3: Totals				41K (1.5)		220K	261k		50K (1.5)		310K	360K
Objective 4: Where feasible, control or eradicate established AIS that have a significant impact.												
Strategy 4A: Limit the dispersal of established AIS into new waterbodies or into new areas of a waterbody or drainage.												
4A1	Boat wash stations	AIS Coord, AISAC, Fed, Muni, Counties, NGO's	AGFD, Maricopa Cty, ASP	15K (0.3)	FS, NPS, BLM	100K	115k	AGFD, Maricopa Cty, ASP	15K (0.3)	FS, NPS, BLM	100K	115k
4A2	Limit access to AIS populations	AIS Coord, AISAC, Fed, Muni, Counties, Tribes, NGO's	AGFD, Maricopa Cty, ASP	3K (>0.1)	FS, NPS, BLM	10K	13k	AGFD, Maricopa Cty	3K (>0.1)	FS, NPS, BLM	20K	23k
4A3	AIS information & signage	AIS Coord, AISAC, Tribes, Fed, Muni, NGO's, Private	AGFD, ADA	50K (>0.1)	FWS, FS, NPS, BLM	100K	150K	AGFD, ADA	65K	FWS, FS, NPS, BLM	200K	265K

Strategies/Actions		Implementing Entities and Cooperating Organizations	Funding (in thousands) and Personnel Needs (FTE's)									
Task ID #	Task Name or Description		FY 12 and FY 13 {funds/FTE's per year}					FY 14 and FY 15 {funds/FTE's per year}				
			State Funds		Federal Funds (U.S.)		Total	State Funds		Federal Funds (U.S.)		Total
			Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$	Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$
Strategy 4B: Limit the dispersal of established AIS to new waterbodies or to new areas of a waterbody.												
4B1	Control Priority Classes	AIS coord, AISAC, Tribes, Fed, Muni, NGO's	AGFD, ADA	10K (>0.1)	FWS, FS, NPS, BLM	250K	260K	AGFD, ADA	30K	FWS, FS, NPS, BLM	500K	530K
Objective 4: Totals				78K (0.3)		460K	538K		83K (0.4)		820K	903K
Objective 5: Increase knowledge of AIS in Arizona through compiling data and conducting research.												
Strategy 5A: Facilitate the collection and dispersal of information, research, and data on AIS in Arizona.												
5A1	Create AIS database & reference material repository	AIS Coord, AISAC, Universities, Fed	AGFD, ADA	15k (0.2)	FWS, FS, NPS	NA	15K	AGFD, ADA	15k (>0.1)	FWS, FS, NPS	NA	15K
5A2	Maintain AIS database & website, "The Center"	AIS Coord, AISAC Universities, Fed	See 5A1									

Strategies/Actions		Implementing Entities and Cooperating Organizations	Funding (in thousands) and Personnel Needs (FTE's)									
Task ID #	Task Name or Description		FY 12 and FY 13 {funds/FTE's per year}					FY 14 and FY 15 {funds/FTE's per year}				
			State Funds		Federal Funds (U.S.)		Total	State Funds		Federal Funds (U.S.)		Total
			Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$	Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$
5A3	Document AIS distribution & abundance	AIS Coord., AISAC, Tribes, Fed, Private, Universities	AGFD, ADA	5K (>0.1)	FWS, FS, NPS, BOR, BLM, COE	10K	15K	AGFD, ADA	10k	FWS, FS, NPS, BOR, BLM, COE	15	25K
5A4	Maintain list of AIS taxonomic experts	AIS Coord, AISAC, Universities, Fed	AGFD, ADA	2K (>0.1)	FWS, FS, NPS	NA	2K	AGFD, ADA	4K (>0.1)	FWS, FS, NPS	NA	4K
Strategy 5B: Research AIS for their impact on native biota utilizing regional efforts & literature searches.												
5B1	AIS life history & impact	AIS Coord, AISAC, Universities, Fed	AGFD, ADA	2k (>0.1)	FWS, FS, NPS	NA	2K	AGFD, ADA	4K (>0.1)	FWS, FS, NPS	NA	4K
5B2	Continue monitoring native aquatic biota	AIS Coord, AISAC, Tribes, Fed, Universities	AGFD, ADA, Universities	5k (>0.1)	FWS, FS, NPS	10k	15K	AGFD, ADA	5K (>0.1)	FWS, FS, NPS	15K	20K
5B3	Evaluate AIS as vectors (disease, parasites)	AIS Coord, AISAC, Tribes, Fed, Universities	See 5B2									

Strategies/Actions		Implementing Entities and Cooperating Organizations	Funding (in thousands) and Personnel Needs (FTE's)									
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			State Funds		Federal Funds (U.S.)		Total	State Funds		Federal Funds (U.S.)		Total
			Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$	Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$
Strategy 5C: Research management alternatives for their effect on AIS and native species.												
5C1	Investigate AIS & anthropogenic relationships	AIS Coord, AISAC, Tribes, Fed, Universities	See 5B2									
5C2	New AIS management methods	AIS Coord, AISAC, Tribes, Fed, Universities	AGFD, ADA, Universities	2K (>0.1)	Various	10k	12K	AGFD, ADA, Universities	2K (>0.1)	Various	15k	17K
5C3	Herbicide & pesticide effects	AIS Coord, AISAC Tribes, Fed, Universities	ADA, AGFD	5K (0.2)	APHIS, FWS, FS, NPS	30K	35K	ADA, AGFD	7k (0.2)	APHIS, FWS, FS, NPS	50K	57K
Objective 5: Totals				36K (0.3)		60K	99K		47K		95K	142K
Objective 6: Inform the public, policy makers, natural resource workers, private industry, and user groups about the risks and impacts of AIS.												
Strategy 6A: Inform the public about AIS, and how their actions can help prevent the spread and reduce the impacts of AIS.												

Strategies/Actions		Implementing Entities and Cooperating Organizations	Funding (in thousands) and Personnel Needs (FTE's)									
Task ID #	Task Name or Description		FY 12 and FY 13 {funds/FTE's per year}					FY 14 and FY 15 {funds/FTE's per year}				
			State Funds		Federal Funds (U.S.)		Total	State Funds		Federal Funds (U.S.)		Total
			Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$	Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$
6A1	Include AIS information in hunter and boater classes	AIS Coord, AGFD	AGFD	5K (>0.1)	NA	NA	5K	AGFD	5K (>0.1)	NA	NA	5K
6A2	Education curriculum	AIS Coord, AISAC, Fed	AGFD, ADA	5K (>0.1)	FWS, FS, NPS	5K	10k	AGFD, ADA	5K (>0.1)	FWS, FS, NPS	5k	10K
6A3	AIS Traveling Trunk	AIS Coord, AISAC, Fed	AGFD, ADA	3K (>0.1)	FWS, FS, NPS	NA	3K	AGFD, ADA	3K (>0.1)	FWS, FS, NPS	NA	3K
6A4	Press releases & PSAs & org. magazine articles (WV)	AIS Coord, AISAC, Fed, NGO's	AGFD, ADA, SRP, CAP	NA	FWS, FS, NPSBLM, BOR	NA	NA	AGFD, ADA, SRP, CAP	NA	FWS, FS, NPSBLM, BOR	NA	NA
6A5	Produce articles, videos, billboards, web media,	AIS Coord, AISAC, Fed, NGO's	AGFD, ADA, SRP, CAP	15K (0.2)	FWS, FS, NPSBLM, BOR	50K	65K	AGFD, ADA, SRP, CAP	25K (0.2)	FWS, FS, NPSBLM, BOR	75K	100K
6A6	Distribute AIS information	AIS Coord, AISAC, Fed, NGO's	AGFD, ADA, SRP, CAP	5K (>0.1)	FWS, FS, NPSBLM, BOR	10K	15K	AGFD, ADA, SRP, CAP	5K (>0.1)	FWS, FS, NPSBLM, BOR	25K	30K

Strategies/Actions		Implementing Entities and Cooperating Organizations	Funding (in thousands) and Personnel Needs (FTE's)									
Task ID #	Task Name or Description		FY 12 and FY 13 {funds/FTE's per year}					FY 14 and FY 15 {funds/FTE's per year}				
			State Funds		Federal Funds (U.S.)		Total	State Funds		Federal Funds (U.S.)		Total
			Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$	Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$
6A7	Include AIS information in hunting/ fishing/ boating regs	AIS Coord, AGFD	See 6A1									
6A8	Develop plant labeling system	AIS Coord, AISAC, ADA	ADA	5K (0.1)	APHIS, Various	20K	25K	ADA	3K (>0.1)	APHIS, Various	25K	23K
6A9	In form decision makers about AIS	Governor's Office, AIS Coord, AISAC, Tribes, Fed, NGO, Private	AGFD, ADA, ASP	2K (>0.1)	FWS, FS, NPS, BOR, COE, BLM	3K	5K	AGFD, ADA, ASP	2K (>0.1)	FWS, FS, NPS, BOR, COE, BLM	3K	5K
6A10	Network with aquatic education programs	AIS Coord, AGFD	See 6A1									

Strategies/Actions		Implementing Entities and Cooperating Organizations	Funding (in thousands) and Personnel Needs (FTE's)									
Task ID #	Task Name or Description		FY 12 and FY 13 {funds/FTE's per year}					FY 14 and FY 15 {funds/FTE's per year}				
			State Funds		Federal Funds (U.S.)		Total	State Funds		Federal Funds (U.S.)		Total
			Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$	Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$
6A11	Foster outreach with sporting & conservation organizations	AIS Coord, AISAC, Tribes, Fed, NGO, Muni, Private	AGFD, ADA, ASP	3K (>0.1)	FWS, FS, NPS, BOR, COE, BLM	7K	10K	AGFD, ADA, ASP	3K (>0.1)	FWS, FS, NPS, BOR, COE, BLM	12K	15K
Strategy 6B: Train natural resources personnel in AIS identification.												
6B1	AIS Identification seminars	AIS Coord, AISAC, Tribes, Fed, Universities	AGFD, ADA, ASP	3K (>0.1)	FWS, FS, BLM, NPS	12K	15K	AGFD, ADA, ASP	3K (>0.1)	FWS, FS, BLM, NPS	12K	15K
Strategy 6C: Inform private industry in AIS identification, their effects, and the laws regulating them.												
6C1	Nursery, pet store and bait dealer flyers	AIS Coord, AISAC, Fed, NGO's	AGFD, ADA, SRP	3k (>0.1)	FWS, FS, BLM, NPS	NA	3K	AGFD, ADA, SRP	3k (>0.1)	FWS, FS, BLM, NPS	NA	3K
6C2	Provide information at fish tourn.	AIS Coord, AISAC, Fed, NGO's	AGFD, ADA, SRP	2k (>0.1)	FWS, FS, BLM, NPS	NA	2K	AGFD, ADA, SRP	2k (>0.1)	FWS, FS, BLM, NPS	NA	2K

Strategies/Actions		Implementing Entities and Cooperating Organizations	Funding (in thousands) and Personnel Needs (FTE's)									
Task ID #	Task Name or Description		FY 12 and FY 13 {funds/FTE's per year}					FY 14 and FY 15 {funds/FTE's per year}				
			State Funds		Federal Funds (U.S.)		Total	State Funds		Federal Funds (U.S.)		Total
			Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$	Lead Agency(s)	\$ (FTE's)	Lead Agency(s)	\$	\$
6C3	Distribute AIS information to others	AIS Coord, AISAC, Fed, Muni, NGO's, Private	AGFD, ADA, SRP	5k (>0.1)	FWS, FS, BLM, NPS	10k	15K	AGFD, ADA, SRP	7k (>0.1)	FWS, FS, BLM, NPS	15k	22K
Objective 6: Totals				56K (0.3)		117K	163K		66K (0.4)		172K	335K

Program Monitoring and Evaluation:

Evaluation of the AIS management plan's progress and performance will occur as summations of actions and responses are reported by lead agencies on their respective responsibilities, as delineated in the implementation table. Funding has been allocated for numerous actions which will contribute to monitoring and evaluation of individual tasks, and the overall plan. The development of monitoring programs, encouragement of public monitoring actions, and focused monitoring of high-risk water bodies and water delivery systems will provide critical feedback as to the most pressing issues to be addressed, and adaptive management strategies that may warrant consideration for future implementation.

On an annual basis, agencies will provide feedback on objectives, strategies and actions implemented within the year; the sum of these reports will be examined by a Plan Implementation Panel under the direction of the Arizona Invasive Species Advisory Council. Successes of the plan will be evaluated each year by the Plan Implementation Panel based both on progress in meeting the plan objectives as well as successful implementation of identified tasks. The AIS plan will be evaluated based primarily on the completion of specific tasks identified for each year in the implementation table.

Results of the evaluation will be summarized in an annual report that will include:

- A qualitative description of progress towards each of the objectives
- A complete list of tasks identified in the previous year's work plan, budgetary needs identified for each, along with resources procured and resources expended.
- Designation of the implementation status (full, partial, or not implemented) of each task identified in the previous year's work plan and a brief justification of the designation.
- A summary of resource requirements to achieve full implementation of tasks listed as partially or not implemented.

Evaluation of annual progress will play an important role in directing activities for the following years, as well as restructuring tasks identified in the original plan. Some characteristics which may be examined may consist of the rate of accomplishment of objectives, rate of spread and or containment of AIS among waterways, assessment of changes in habitat acreage of AIS and or displaced native species, changes in population sizes of AIS and impacted species, and changes in federal and state threatened and endangered species lists regarding AIS impacted native species. Work plans for upcoming years will be constructed alongside each annual program evaluation document, which will assist in keeping tasks updated and providing a means to deal with unforeseen challenges. Variations in seasonal rainfall and weather, drought, wildfire, and other climatic conditions may have an effect on ability to successfully implement management and recovery plans; consistent program monitoring and evaluation should assist in keeping plan actions and implementation on schedule and effective.

Glossary

Accidental introduction: an introduction of non-indigenous aquatic species that occurs as the result of activities other than the purposeful or intentional introduction of the species involved. For example, the transport of non-indigenous species in ballast water or in water used to transport fish, mollusks, or crustaceans for aquaculture or other purposes.

Aquatic invasive species (AIS): any aquatic species that is not native to the ecosystem under consideration and whose introduction or presence in this state may cause economic or environmental harm or harm to human health. This does not include any nonindigenous species lawfully or historically introduced into this state for sport fishing recreation. (Note: for the purposes of the State management plans, reference to an aquatic invasive species will imply that the species is non-indigenous.)

Baitfish: fish species commonly sold for use as bait for recreational fishing.

Control: limiting the distribution and abundance of a species.

Cryptogenic species: a species that may or may not be indigenous to an area.

Ecological integrity: the extent to which an ecosystem has been altered by human behavior; an ecosystem with minimal impact from human activity has a high level of integrity; an ecosystem that has been substantially altered by human activity has a low level of integrity.

Ecosystem: an assemblage of biological organisms, the interaction among them, and the non-living factors of the environment contributing to their structure and function.

Environmentally sound: methods, efforts, actions, or programs to prevent introductions or to control infestations of AIS that minimize adverse environmental impacts. The impact of management actions should be less than the impact of the AIS.

Eradicate: the act or process of eliminating an aquatic invasive species.

Eutrophication: The enrichment of bodies of fresh water by inorganic plant nutrients (e.g. nitrate, phosphate). It may occur naturally but can also be the result of human activity (cultural eutrophication from fertilizer runoff and sewage discharge) and is particularly evident in slow-moving rivers and shallow lakes.

Exotic: any species or other variable biological material that enters an ecosystem beyond its historic range, including such organisms transferred from one county to another (see nonindigenous and non-native).

Fouling: An accumulation of organisms that attaches to naturally occurring and manmade submerged hard surfaces such as rocks, shells, ships, intake pipes, and other submerged

equipment or machinery. Mobile organisms that may be tucked in nooks created by the larger animals are also considered part of the “fouling community”.

Intentional introduction: all or part of the process by which a non-indigenous species is purposefully introduced into a new area.

Non-indigenous species: any species or other variable biological material that enters an ecosystem beyond its historic range, including such organisms transferred from one country to another (see exotic and non-native).

Non-native: any species or other variable biological material that enters an ecosystem beyond its historic range, including such organisms transferred from one country to another (see exotic and non-native).

Pathogen: A microbe or other organism that causes disease.

Pathways: Natural and human transport connections that allow movement of species or their reproductive propagules from place to place.

Pioneer infestation: a small AIS colony that has spread to a new area from an established colony.

Priority species: an AIS that is considered to be a significant threat to Arizona waters and is recommended for immediate or continued management action to minimize or eliminate their impact. Introduction of species may have an especially large impact on ecosystem function, endangered species, infrastructure, human health, etc.

Vector: Vector is synonymous with “pathway,” see definition above. As such, vector is defined more broadly in this report than in its narrower more common definition as a pathway solely for pathogens.

Watershed: a hydrologically bound drainage basin including all living and nonliving components.

ACKNOWLEDGEMENTS: Several persons assisted in the writing and editing of this Report.

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Also, the Connecticut, California, and New Mexico ANS plans were of great assistance as reference points when constructing the Arizona plan.

APPENDIX A: Freshwater non-indigenous animals in Arizona

Listed species are restricted by ARTICLE 4. LIVE WILDLIFE, R12-4-406.

Restricted Live Wildlife

Freshwater Animal Species of Concern

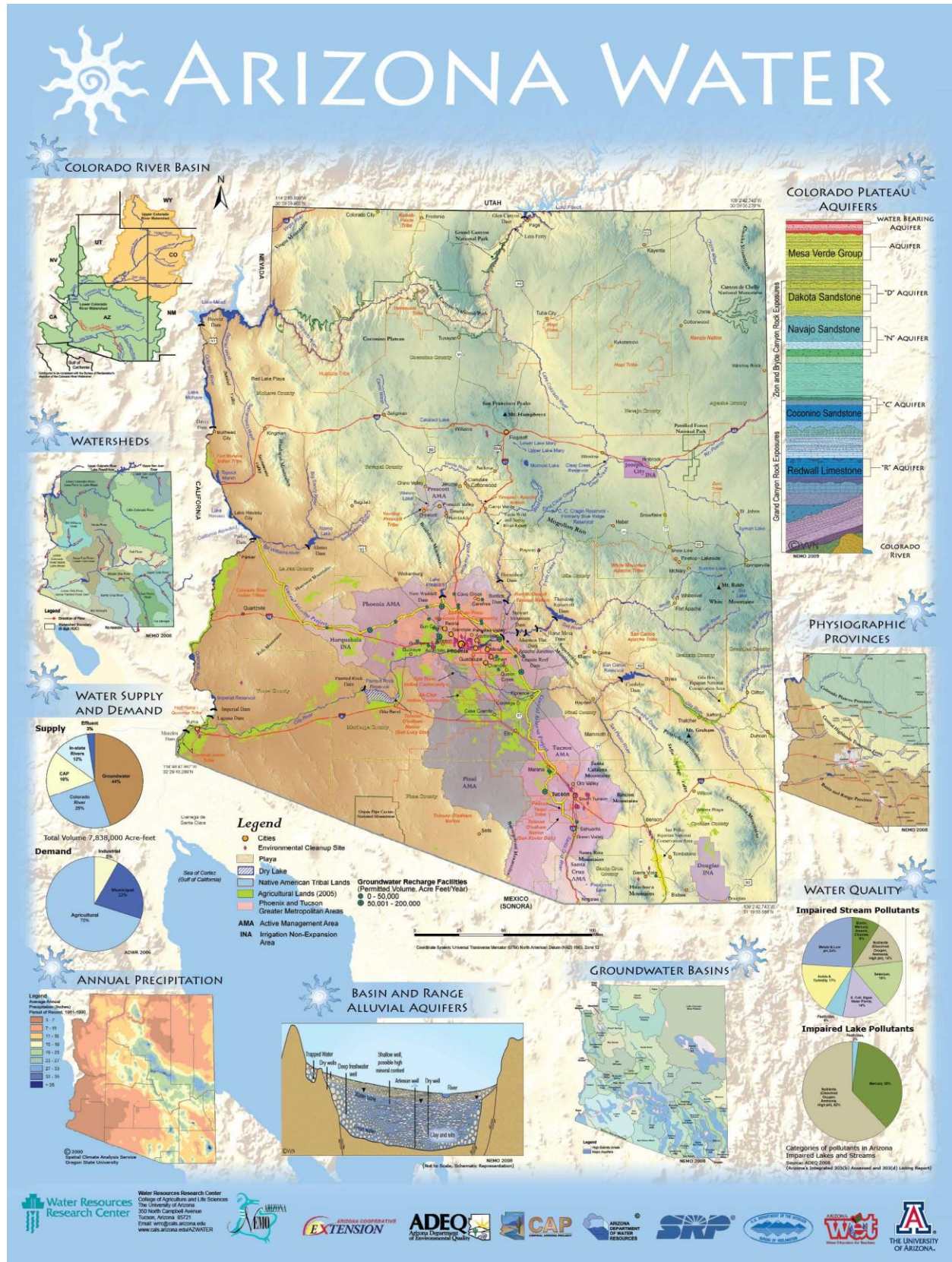
Common name	Species name
Reptiles	
Caimans	
Crocodiles	all species of order Crocodylia
Alligators	
Snapping turtles	all species of the family Chelydridae
Sea snakes	all species of the family Hydrophiidae
Amphibians	
Clawed frogs	all species of the genus <i>Xenopus</i>
Giant or marine toads	<i>Bufo horribilis</i> , <i>Bufo marinus</i> , <i>Bufo paracnemis</i>
Bullfrogs	all species of genus <i>Rana</i>
Fish	
Arctic grayling	<i>Thymallus arcticus</i>
Bass	all the species of the family Serranidae
Bighead carp	<i>Aristichthys nobilis</i>
Black carp	<i>Mylopharyngodon piceus</i>
Bony tongue	<i>Arapaima gigas</i>
Bowfin	<i>Amia calva</i>
Catfish	all species of the family Ictaluridae
Crucian carp	<i>Carassius carassius</i>
Electric catfish	<i>Malapterurus electricus</i>
Electric eel	<i>Electrophorus electricus</i>
European whitefish	<i>Leuciscus idus</i> , <i>Idus idus</i>
Freshwater drum	<i>Aplodinotus grunniens</i>
Freshwater stingray	all species of the family Potamotrygonidae
Gars	all species of the family Lepisosteidae
Goldeye, mooneye	all species of the family Hiodontidae
Herring	all species of the family Clupeidae
Indian carp	all of the species <i>Catla catla</i> , <i>Cirrhina mrigala</i> , and <i>Labeo rohita</i>

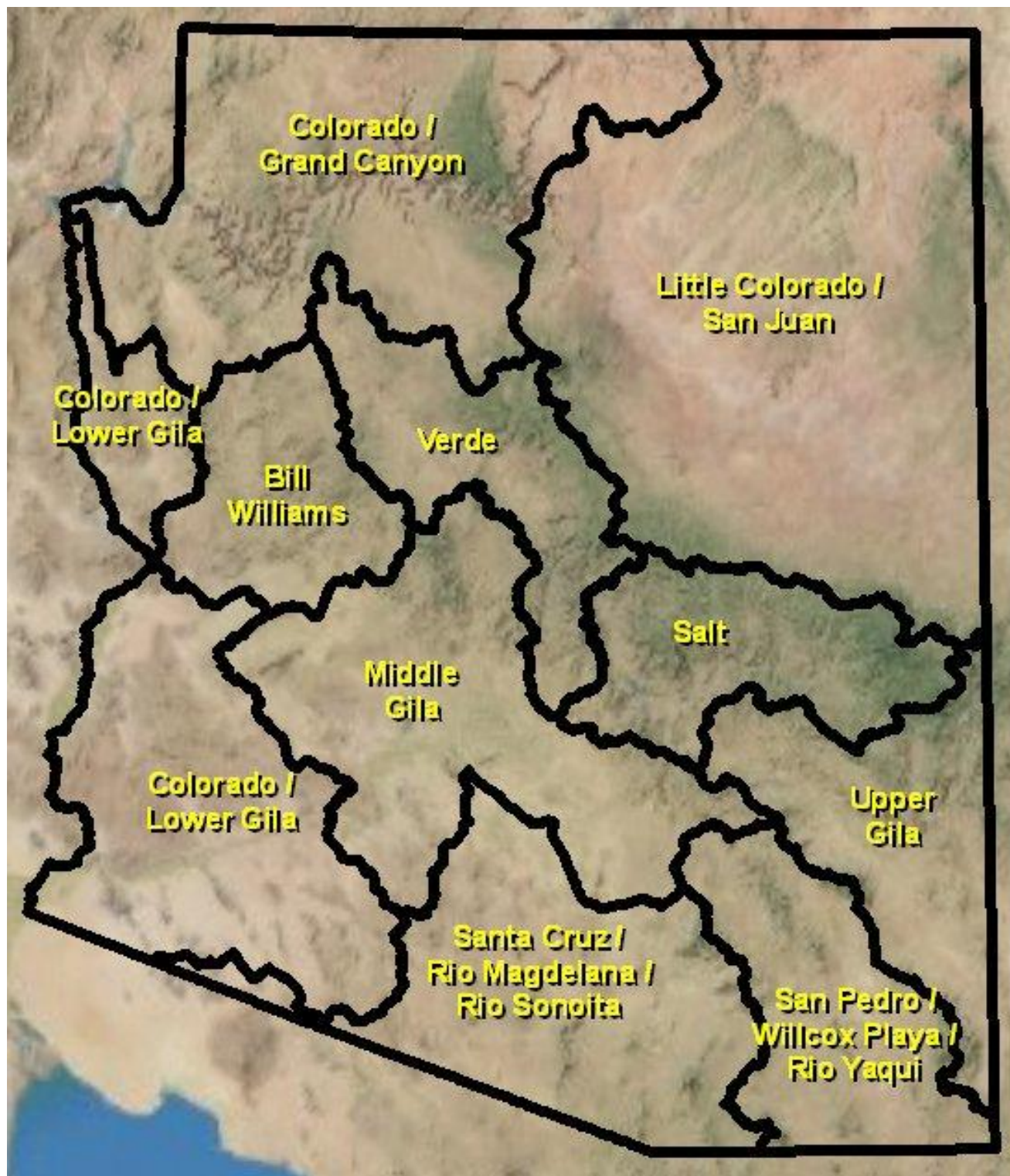
Lampreys	all species of the family Petromyzontidae
Nile perch	all species of the genus <i>Lates</i>
Pike, pickerel	all species of the family Esocidae
Pike topminnow	<i>Belonesox belizamus</i>
Piranha	all species of the genera <i>Serrasalmus</i> , <i>Serrasalmo</i> , <i>Phylocentrus</i> , <i>Teddyella</i> , <i>Fooseveltiella</i> , and <i>Pygopristis</i>
Rudd	<i>Scardinius erythrophthalmus</i>
Shad	all species of the family Clupeidae except threadfin shad, species <i>Dorosoma</i> <i>petenense</i>
Sharks	all species, marine and freshwater of orders Hexanchiformes, Heterodontiformes, Squaliformes, Pristiophoriformes, Squatiniiformes, Orectolobiformes, Lamniformes, and Carcharhiniformes
Silver carp	<i>Hypophthalmichthys molitrix</i>
Snakehead	all species of the family Ophicephalidae
South American parasitic catfish	all species of the family Trichomycteridae and Cetopsidae
Sunfish	all species of the family Centrarchidae
Temperate basses	Moronidae
Tetras	all species of the genus <i>Astyanax</i>
Tiger fish	<i>Hoplias malabaricus</i>
Trout	all species of the family Salmonidae
White amur, grass carp	<i>Ctenopharyngodon idella</i>
Walking catfish	all species of the family Clariidae
Walleye	all species of the family Percidae
Invertebrates	
Asiatic mitten crab	<i>Eriocheir sinensis</i>
Crayfish	all species of family Astracidae, Cambaridae, Parastacidae
Asian clam	<i>Corbicula fluminea</i>
New Zealand mudsnail	<i>Potamopyrgus antipodarum</i>
Quagga mussel	<i>Dreissena bugensis</i>
Rosy wolfsnail	<i>Euglandina rosea</i>
Zebra mussel	<i>Dreissena polymorpha</i>

APPENDIX B: Freshwater non-indigenous plants in Arizona

Common Name	Scientific Name
Plants that are currently causing problems in Arizona:	
Brazilian elodea	<i>Egeria densa</i>
Curly leaf pondweed	<i>Potamogeton crispus</i>
Giant salvinia	<i>Salvinia molesta</i>
Hydrilla	<i>Hydrilla verticillata</i>
Parrot-feather	<i>Myriophyllum aquaticum</i>
Water-cress	<i>Nasturtium officinale</i>
Plants with Apparent Limited Distribution and Weedy Potential:	
Eurasian water-milfoil	<i>Myriophyllum spicatum</i>
Species of Concern Being Sold in Arizona, But Not Established in the Wild:	
Water-hyacinth	<i>Eichhornia crassipes</i>
Introduced Plant Species, But Not Causing Problems:	
Dotted duckweed	<i>Landoltia (Spirodela) punctata</i>
Yellow floating-heart	<i>Nymphoides peltata</i>
Species Of Concern in Other States, Not Yet Introduced to Arizona:	
Anchored water hyacinth	<i>Eichhornia azurea</i> (SW)
Water-chestnut	<i>Trapa natans</i> L.

APPENDIX C: Arizona Water and Watershed Maps





APPENDIX D: Acronym List

ADA: Arizona Department of Agriculture
ADEQ: Arizona Department of Environmental Quality
ADOT: Arizona Department of Transportation
AGFD: Arizona Game and Fish Department
AIS: Aquatic invasive species
AISAC: Arizona Invasive Species Advisory Council
ANSTF: Aquatic Nuisance Species Task Force
APHIS: Animal and Plant Health Inspection Service
AzAIS: Arizona Aquatic Invasive Species Management Plan
BLM: US Bureau of Land Management
BoR: US Bureau of Reclamation
CAP: Central Arizona Project
CoE: US Army Corp of Engineers
CWA: Clean Water Act
DHS: Department of Homeland Security
DoD: Department of Defense
EDRR: Early detection, rapid response
EPA: US Environmental Protection Agency
ESA: Endangered Species Act
INRMP: Integrated natural resource management plan
MUN: Municipalities
NANPCA: Non-indigenous Aquatic Nuisance Prevention and Control Act
NGO: Non-governmental organization
NISA: National Invasive Species Act
NOAA: National Oceanic and Atmospheric Administration
NPS: National Park Service
NZMS: New Zealand mudsnail
PPQ: Plant protection and quarantine
SRP: Salt River Project
UA: University of Arizona
USCG: US Coast Guard
USFS: US Forest Service
USFWS: US Fish and Wildlife Service
USGS: US Geological Survey
WGA: Western Governors Association
WRP: Western Regional Panel

APPENDIX E: Aquatic Invasive Species Authorities and Programs

Federal Agencies Regulating the Transport of Live Aquatic Products

Federal Agencies Regulating the Transport of Live Aquatic Products (Olson and Linen 1997).

	Restrict Movement Into U.S.	Restrict Interstate Movement	Regulate Product Content or Labeling
Plants	APHIS DOD Customs DEA	APHIS AMS	APHIS AMS
Fish	FWS Customs USCG	FWS	FWS
Invertebrates	APHIS FWS ARS PHS Customs USCG	APHIS FWS	FWS

List of abbreviations and descriptions of authority (Olson and Linen 1997)

ORGANIZATION

DESCRIPTION

APHIS	The Animal and Plant Health Inspection Service, U.S. Department of Agriculture, has broad mandates related to the importation and interstate movement of exotic species, under the Federal Plant Pest Act, the Plant Quarantine Act, and several related statutes. The primary concern is species that pose a risk to agriculture. Restricts the movements of agricultural pests and pathogens into the country by inspecting, prohibiting, or requiring permits for the entry of agricultural products, seeds, and live plants and animals. Restricts interstate movements of agricultural plant pests and pathogens by imposing domestic quarantines and regulations. Restricts interstate transport of noxious weeds under the Federal Noxious Weed Act.
AMS	The Agricultural Marketing Service, U.S. Department of agriculture, works closely with states in regulating interstate seed shipments. Regulations require accurate labeling and designation of “weeds” or “noxious weeds” conforming to the specific state’s guidelines.
ARS	The Agricultural Research Service, U.S. Department of Agriculture, the research branch of USDA, conducts and funds research on the prevention,

control, or eradication of harmful exotic species often in cooperation with APHIS. Projects include aquaculture techniques and disease diagnosis and control.

DEA	The Drug Enforcement Agency restricts imports of a few non-indigenous plants and fungi because they contain narcotics substances.
DOD	The Department of Defense has diverse activities related to non-indigenous species. These relate to its movements of personnel and cargo and management of land holdings. Armed forces shipments are not subject to APHIS inspections. Instead, the DOD uses military customs inspectors trained by APHIS and the Public Health Service.
FWS	The Fish and Wildlife Service, U.S. Department of the Interior, has responsibility for regulating the importation of injurious fish and wildlife under the Lacey Act. Maintains a limited port inspection program. In 1990, FWS inspectors inspected 22 percent of the wildlife shipments at international ports of entry. Interstate movement of state-listed injurious fish and wildlife is a federal offense and therefore potentially subject to FWS enforcement. Also provides technical assistance related to natural resource issues and fish diseases to state agencies and the private sector (aquaculture in particular). Helps control the spread of fish pathogens.
NOAA and NMFS	The National Oceanic and Atmospheric Association and National Marine Fisheries Service, U.S. Department of Commerce, inspect imported shellfish to prevent the introduction of non-indigenous parasites and pathogens. Cooperative agreements with Chile and Australia; Venezuela has requested a similar agreement.
PHS	The Public Health Service, U.S. Department of Health and Human services, regulates entry of organisms that might carry or cause human disease.
US Customs	Customs Service, U.S. Department of the Treasury. Customs personnel inspect passengers, baggage, and cargo at U.S. ports of entry to enforce the regulations of other federal agencies. They inform interested agencies when a violation is detected and usually detain the suspected cargo for an agency search.
USCG	The Coast Guard, U.S. Department of Treasury, was given certain responsibilities under the Non-indigenous Aquatic Prevention and Control Act of 1990, relating to preventing introductions (mostly dealing with ballast water exchange).

APPENDIX F: Arizona Aquatic Invasive Species Management Plan Public Review/Comments

This appendix contains information covered in state-wide public meetings of involved stakeholders for approval of this Arizona AIS Plan. The original DRAFT of this plan was introduced to the public in November, 2010, with an associated public comment period extending through January, 2011. To date, public comments on the AIS plan have been overwhelmingly supportive in nature. Additional suggestions, such as a “boat inspection-sticker” system for out of state boats, and random inspection of boats for AIS have been received as well.

Received via email on 10/26/2010 from Mr. Brian Jones.

“As a kayaker, I strongly support the efforts being made to control aquatic invasive species within Arizona. The consequences of infestation of Arizona waters by invasive species ranges to severe and, as the saying goes, an ounce of prevention is worth a pound of cure. Once invasive species get a foot hold, they can be difficult or impossible to control.

If anything, I would advocate for even more stringent requirements to prevent the spread of aquatic invasive species, including, resources permitting, complete or random inspections of boats entering non-infested waters.

Regards,

Brian Jones
Tucson”

Received via email on 10/29/2010 from Mr. Darin Kelley, Natural Resources Manager, Arizona Department of Transportation.

“To Whom It May Concern:

I am writing this to express support of intensive aquatic species management. As a Natural Resources Manager with the Ariz. Department of Transportation, I work very extensively to control or eradicate many different invasive species, understanding the negative impact they have. The management of these species is necessary to mitigate negative impact economically, environmentally and in regards to the integrity of physical structures, as a few examples. Aquatic invasives require intensive management in which many resources are needed. Information is needed to educate the public regarding its impacts and what should be done to stop the spread and manage these species. I would like to reiterate my support for more intensive and wide-spread management of eliminating/controlling these species throughout Arizona. Thank you for your time and consideration of my voice regarding this issue.”

Received via email on 12/1/2010 from Mr. Jim Shalscheider, Lake Havasu Marine Association

“Calif boaters are over two thirds of our boating visitors. Their requirements at the inspection stations include a very close inspection of the anchor and the chain. It would be helpful if your one page guide highlighted that. For the boaters convenience, have it in plain sight!”

Received via email on 12/1/2010 from Mr. Gary Berlin, American Fly Fishing Trade Association

“Arizona Game and Fish Department:

Thank you for allowing the fishing community the opportunity to review and make comments on Arizona’s regulatory recommendations pertaining to aquatic invasive species.

On behalf of the American Fly Fishing Trade Association, we applaud Arizona’s efforts to restrict the movement and contain and control the invasive aquatic species identified in your proposed management plan. ANS left uncontrolled or allowed to move from their current locations has far-reaching and detrimental ecological impacts that irreparably harm the aquatic resource and in turn, causes economic harm to the fishing industry.

Thanks again for allowing us to review the draft management plan. “

Received via email on 12/13/10 from Mr. James Brown.

“my recommendation to game & fish is to have all out of state boaters entering our state be checked by a game & fish office and receive a sticker that can be visible by game & fish or whoever is monitoring our waterways that the boat has been cleared to use our waterways. cost of sticker should be low. cost of fine for those that dont have sticker should be high. this will insure no new infections will come into our state via boats, this will also generate more income for game & fish (IE sticker). for local boats if a boat washing station was built at each lake that has a problem with invasive species and a ticket printed after washing was completed to be given to a person at a check station. or a punch card received when entering launch ramp and punched when boat washing has been completed to be turned in when registration is due. just a thought
thank you JAMES BROWN.”

Received from Kirk Kock, US Bureau of Land Management, Fisheries Project Manager – Lake Havasu City. 1/4/2011.

“Just wanted to extend my congratulations and endorsements of the draft plan. This is great to see!

Following are a few opinions and edits;

Pg 6, 1st paragraph, then on into text, the terms AIS and ANS are used interchangeably. This may cause some confusion and could be made more consistent to aid novice readers.

Pg 9, 2nd bullet should read..... access to accurately locate the latest.....

In Process & Participation, 5th line from bottom, add plan after Arizona

Pg 10, Federal section, references appendix B, C, & D, but not Appendix A.

Pg 20, I really like the priority approach, last entry under Priority 2 does not have a bullet marker out in front.

Pg 21, the listing of bullets only mentions federal once. I'd prefer the plan be more assertive and specifically identify federal land managers as members of the AISAC make the tie in several other bullets to clarify Fed land manager participation, and cooperation in making the AIS plan successful. Federal Gov is the largest land owner in Az., use this State plan to motivate Federal land managers & enable them to pursue enhance budgets to help.

Pg. 23, Gaps Section, last bullet makes me feel like Arizona State Parks, who enable more vessels on Arizona waters than probably any other entity, are either fully engaged (I know better), or exempt from ANS monitoring/enforcement. This plan needs to help ASP, help us.

Pg 25, Current Activities Section, ADA has authority to inspect and declare, but what is the authority? Also the second sentence in the ADA section is redundant saying the same as the 1st. I'd like to see this describe how ADA confirms and declares ANS already in the field.

Pg 26, fifth bullet from top of page is indented too far. Strategy 2A3, add the boating industry ie, sales, marina, repair, parts, etc.

Pg 27, Strategy 2C1, doesn't the authority already exist to stop and inspect vehicles/vessels/water equipment? Maybe change the 1st word from Establish to Enforce.

Pg. 28, Current Agency Activities - ADA, last sentence, how do the people get ADA attention to inspect field situations? Phone #, maybe need to create a hot line to do just that.

Pg 29 , USF&WS section, last sentence before bullets should be a set apart header in bold to be consistent with other text. Also I think last bullet could read more like.....Surface water quality standards lack biological criteria to determine for impairment of beneficial uses due to AIS.

pg 30, Strategy 3B1, suggest adding priority before AIS

The 4 appendices are excellent references.

Good work & Happy New Year.”

ALL ISSUES ADDRESSED BY AUTHORS

Received from Lesly Swanson, Senior Environmental Scientist - Salt River Project. 8/5/2011

1. “Page 12 of the landscape formatted document states that *“CAP takes water from Lake Pleasant and delivers it to Salt River Project (SRP) canals: this water is then delivered for municipal, agricultural and industrial use in central Arizona and many public and private urban lakes in the Phoenix metropolitan area”*. This statement is not entirely true. CAP does deliver water to SRP canals; however, the delivery schedule is intermittent and dependent upon water orders placed by the cities. The majority of the water in the CAP canals is delivered to Tucson. Thus, the “hydrologic connection with infected waters” to SRP canals is not continuous. The main sources of water flowing through SRP canals are the reservoirs on the Salt and Verde River systems and wells in the Phoenix metropolitan area.

2 Page 12 of the landscape formatted document states that *“Little can be done to stop the downstream spread of quagga from infected waters, but these waters can be isolated and the quagga contained through cooperative partnerships between recreational water users, commercial ventures, water and land management entities and government agencies and organizations”*. SRP’s question is how can these waters be isolated and quaggas contained? The only way to isolate waters is to turn the water off. SRP’s water is supplied by a series of a chain of lakes that feed into the canal system. Thus, it is not possible to “isolate and contain” quaggas should they infect one of the lakes in the chain. If the thought is to isolate and contain urban lakes, then perhaps it is possible to do so although it is not clear exactly what will be isolated in the document.

3. Page 12 of the landscape formatted document refers to the *“impact on water users and electrical utilities across the state will be widespread”*. Arizona Public Service (“APS”) is a larger “electrical utility” in Arizona than SRP and APS will not be impacted by quagga mussels in the same manner. Thus, we feel that the word ‘electrical’ should be removed from this statement and leave the word ‘utilities’. In leaving the word utilities the document will cover the impact to SRP on both the power and water side, in addition to the water utilities and municipalities.

4. Significant formatting issues still need to be resolved. For example:

- ☐ Areas of yellow highlighting remain in the document
- ☐ There should be a page break between the Executive Summary and the Introduction
- ☐ The page layout of the document is not consistent as the document begins in landscape and then after the tables returns to portrait
- ☐ Numbering issues remain- a number '47' still appears on the cover sheet and the document jumps from page 68 to page 65 after the tables
- ☐ On page 7 under the 'Geographic Scope of Plan' section 'quagga' and 'NZMS' are used and they have not been introduced. Further into the document they listed completely with scientific names. Some people reading the document may not know what NZMS is without it being defined previously.

5. Does the term 'Universities' refer only to the University of Arizona? We realize that UofA is taking a lead in producing this document but there are other educational institutions in the State and Southwest that would be valuable assets in the fight against Aquatic Invasive Species. Perhaps it would be beneficial to add them or mention there are other Universities in the document. Additionally, in the Implementation Table, the terms 'University' and 'Universities' are both listed. What is the difference if there are no other universities named in the document?

6. In the Implementation Table, we feel that the parenthesis around SRP should be removed. They are misleading and seem to imply that SRP is responsible for the amount in parenthesis. In previous discussions with Tom McMahon of AGFD we were told that the parenthesis in the funding section refers to AGFD Full-time equivalent ("FTE").

7. In the Implementation Table, Central Arizona Project ("CAP") is listed under the Federal Funds column. Perhaps the document preparers should check with CAP as to where they wish to be listed, but it is our belief that CAP is a State agency, not federal.

8. In the Implementation Table on page 67 Task ID # 6C1 "*Nursery, pet store and bait dealer flyers*", SRP is listed as a Lead Agency; however we have not provided any flyers to any such entities. We would be open to do so in the future where feasible. The information we do have has been handed out to schools and at other outdoor activities but not specifically to nurseries, pet stores and bait dealers.

If you have any additional questions on SRP's comments, please feel free to contact me.

Thank you,
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ALL ISSUES ADDRESSED BY AUTHORS

On April 27, 2011 comments were received from the ANSTF's preliminary review of the draft AzAIS plan. Comments and suggested revisions included additional content for the geographic scope of the plan, problem definition and ranking, and comments on the prioritization scheme. Many typographical revisions and formatting quirks were also noted. These comments along with continued correspondence with David Britton and Don Maclean were instrumental in streamlining and better elucidating the goals and tasks to be achieved by this plan.

APPENDIX G: Arizona Game and Fish Department Director's Orders

NOTICE OF PUBLIC INFORMATION
ARIZONA GAME AND FISH DEPARTMENT

SECRETARY OF STATE
FILED

2011 JAN 28 AM 8:30

DIRECTOR'S ORDER 1 - R03/11 – AQUATIC INVASIVE SPECIES
LISTING OF AQUATIC INVASIVE SPECIES FOR ARIZONA
EFFECTIVE MARCH 1, 2011

Effective March 1, 2011 the Arizona Game and Fish Department, under the authority of A.R.S. 17-255.01(B), establishes this updated list of aquatic invasive species for the State of Arizona:

<u>Aquatic Invasive Species</u>	<u>Notes</u>
quagga mussel (<i>Dreissena bugensis</i>)	Detected and present in Arizona - January 2007; Lake Mead.
zebra mussel (<i>Dreissena polymorpha</i>)	Not yet detected in Arizona, but poses an imminent threat. Zebra mussels are nearly indistinguishable in appearance from the quagga mussel.
rusty crayfish (<i>Orconectus rusticus</i>)	Not yet detected in Arizona, but constitutes an imminent threat. No positive identification noted among current Arizona crayfish populations.
red claw crayfish (<i>Cherax quadricarinatus</i>)	Not yet detected in Arizona, but constitutes an imminent threat. No positive identification noted among current Arizona crayfish populations.
New Zealand mudsnail (<i>Potamopyrgus antipodarum</i>)	Detected in Arizona – confirmed in 2002; lower Colorado River (Lee's Ferry, Lake Mead)
didymo, a.k.a. rock snot (<i>Didymosphenia geminata</i>)	Detected in Arizona (blooms) – July 2009; below Davis Dam, Lake Havasu on the lower Colorado River.
giant salvinia (<i>Salvinia molesta</i>)	Detected in Arizona – August 1999; on the Arizona/California border at Imperial National Wildlife Refuge near Blythe, CA.

The name and address of agency personnel with whom persons may communicate regarding this Order:

Name: Tom McMahon, Invasive Species Coordinator
Address: Arizona Game and Fish Department, WMHB
5000 W. Carefree Highway, Phoenix, AZ 85086-5000
Telephone: (623) 236-7271
Fax: (623) 236-7366
Email: tmcmahon@azgfd.gov

NOTICE OF PUBLIC INFORMATION
ARIZONA GAME AND FISH DEPARTMENT

SECRETARY OF STATE
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2011 JAN 28 AM 8:30

**DIRECTOR'S ORDER 2 - R03/11 – AQUATIC INVASIVE SPECIES
DESIGNATION OF WATERS OR LOCATIONS WHERE LISTED
AQUATIC INVASIVE SPECIES ARE PRESENT
EFFECTIVE MARCH 1, 2011**

Effective March 1, 2011 the Arizona Game and Fish Department, under the authority of A.R.S. § 17-255.01(B), establishes this list of waters or locations where listed aquatic invasive species are suspected or known to be present. The listing of aquatic invasive species in Arizona is established under the Arizona Game and Fish Department – Director's Order 1 - R03/11, A.A.R. 17, *Register Editor insert page number*, February 18, 2011.

Waters in Arizona where <u>quagga mussel</u> (<i>Dreissena bugensis</i>) are documented and present:
<ul style="list-style-type: none">- Lake Pleasant- Lower Colorado River from Pierce Ferry Rapid (RM277 on Lake Mead) through the southerly international boundary with Mexico including:<ul style="list-style-type: none">Lake MeadLake MohaveLake HavasuImperial ReservoirMittry LakeMartinez LakeTopock Marsh
Water delivery systems in Arizona where <u>quagga mussel</u> (<i>Dreissena bugensis</i>) are documented and present:
<ul style="list-style-type: none">- Central Arizona Project (CAP) aqueduct (from Lake Havasu - Mark Wilmer Pumping plant to CAP canal mile 200 in Apache Junction, AZ)
Water delivery systems in Arizona where <u>quagga mussel</u> (<i>Dreissena bugensis</i>) are suspected:
<ul style="list-style-type: none">- Salt River Project Canal System (commencing at the CAP Interconnect below Granite Reef Dam)- Central Arizona Project (CAP) Aqueduct (from CAP canal mile 200 in Apache Junction to terminus at canal mile 337 south of Tucson, AZ)
U.S. States or Provinces of the Dominion of Canada where <u>quagga mussel</u> (<i>Dreissena bugensis</i>) or <u>zebra mussel</u> (<i>Dreissena polymorpha</i>) are documented and present:
<ul style="list-style-type: none">- Alabama, Arkansas, California, Colorado, Connecticut, Iowa, Illinois, Indiana, Kentucky, Louisiana, Massachusetts, Maryland, Michigan, Minnesota, Missouri, Mississippi, Nebraska, Nevada, New York, Ohio, Oklahoma, Pennsylvania, Texas, Utah, Virginia, Vermont, Wisconsin, West Virginia; and the Provinces of Ontario and Quebec

NOTICE OF PUBLIC INFORMATION
ARIZONA GAME AND FISH DEPARTMENT

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2011 JAN 28 AM 8:31

**DIRECTOR'S ORDER 3 - R03/11 – AQUATIC INVASIVE SPECIES
MANDATORY CONDITIONS ON THE MOVEMENT OF WATERCRAFT, VEHICLES,
CONVEYANCES, OR OTHER EQUIPMENT FROM LISTED WATERS
WHERE AQUATIC INVASIVE SPECIES ARE PRESENT
EFFECTIVE MARCH 1, 2011**

Effective March 1, 2011 the Arizona Game and Fish Department, under the authority of A.R.S. § 17-255.01(B), establishes mandatory conditions for movement of watercraft, vehicles, conveyances, or other equipment necessary to abate, eradicate, or prevent the spread of listed aquatic invasive species (AIS) within or from those waters or locations listed in Arizona Game and Fish Department - Director's Order 2 - R03/11 (Listed Waters), A.A.R. 17, *Register Editor insert page number*, February 18, 2011.

Mandatory Conditions for Movement from Listed Waters/Locations	
Day Use Boater	<p>The following protocols shall be taken for watercraft, vehicles, conveyances, or other equipment (e.g., fishing gear, anchor, etc.) that have been in or on a listed water/location for <u>5 days or less</u>:</p> <p><u>Before leaving the vicinity of any listed water in Arizona:</u></p> <p>Remove any clinging material such as plants, algae, animals, and mud from anchor, boat, motor, trailer, and all other equipment.</p> <p>Remove the plug (when so equipped) and drain the water from the bilge, live-well and any other compartments that may hold water.</p> <p>Drain water from engine, engine compartments, and engine cooling systems.</p> <p>Dry - Allow watercraft, vehicles, conveyances, or other equipment to dry completely.</p> <p>If using watercraft again in less than five days at any other Arizona waters, replace bilge drain plug and disinfect the bilge by pouring not less than one gallon of vinegar into the bilge.</p>
Long Term Use Boater	<p>The following protocols shall be taken for any watercraft, vehicles, conveyances, or other equipment that have been in or on a listed water/location for <u>more than 5 days</u>:</p> <p><u>Before leaving the vicinity of the listed water/location (unless otherwise authorized by the State):</u></p> <p>Remove any clinging material such as plants, algae, animals and mud from anchor, boat, motor, trailer, and all other equipment.</p> <p>Remove the plug (when so equipped) and drain the water from the bilge, live-well, and any other compartments that may hold water.</p> <p>Drain water from engine, engine compartments, and engine cooling systems.</p> <p>Remove all attached invasive species (e.g., adult quagga mussels; New Zealand mudsnails) from boat surfaces, motors, impellers, outdrives, rudders, anchor(s) and through hull fittings.</p>

APPENDIX H: References

- Aquatic Nuisance Species Task Force (D. James Baker, Under Secretary of Commerce for Oceans and Atmosphere and Mollie Beattie, Director of U.S. Fish and Wildlife Service). 1994. *Report to Congress: Findings, Conclusions, and Recommendations of the Intentional Introductions Policy Review*.
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- Ruiz, G.M., A.H. Hines, L.D. Smith, J.T. Carlton. 1995. *An Historical Perspective on Invasion of North American Waters by Nonindigenous Aquatic Species*. AIS Digest: volume 1, number 1.
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